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An evaluation of the determinants of resilience to drought in Malawi

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An Evaluation of the Determinants of Resilience to Drought in Malawi

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A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

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Table of Contents

List of Tables

List of Figures

Abstract

Building resilient communities has emerged as a dominant agenda in the policy arena and in academia in the wake of recent disasters. However, there is a lack of clarity on the specific interventions required to build resilience. Current challenges associated with resilience include ambiguity, unclear measures, and problematized applicability. This thesis evaluates the determinants of resilience to drought in community food systems as a basis for contributing towards a more advanced understanding of resilience.

A schematic model linking the key concepts associated with resilience was developed on the basis of literature review. This model was subsequently applied to a sample of 195 farm households, 16 community meetings and about 45 interviews with key informants across eight villages in Nsanje and Mzimba districts in Malawi interviewed between October 2010 and February 2011. Analysis at household level focused on exploring the causes of vulnerability, the role of livelihood assets and institutions in shaping coping and adaptation, and the implication of these to the meaning of resilience.

The thesis concluded that vulnerability to food insecurity was produced by an interaction of slow and fast moving factors and processes, some of which were highly persistent. Access to livelihood assets and institutions increased short term coping and adaptive capacity but did not effectively predict resilience given unknowns regarding asset availability and liquidity over the long term. Different socio-economic groups associated different meanings

with the concept of resilience, and in some cases, one group achieved 'resilience' at the expense of the larger community. In integrating vulnerability into resilience thinking, the analysis suggested that resilience could be analysed as existing in desirable and undesirable forms. Undesirable resiliencies reinforced the vulnerable state. By addressing the factors that sustain vulnerability, response capacity could be enhanced. This being the case, advanced by this thesis is a shift from focusing on resilience as a utopian goal, in favour of practices that enhance response capacity and letting communities learn for themselves and transform their value sets to ones that are more likely to ensure coping with adverse conditions. The study concludes that the concept of resilience in its current form is of more value as an organising framework within the re-engineering of food, agricultural, development and disaster management policy can be undertaken.

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Declaration

I, Canford Chiroro, declare that I am the sole author of this thesis; that unless otherwise stated all references cited have been consulted by me and that the work of which the thesis is a record has been done by me and that it has not been previously accepted for a higher degree.

Signature ……..…….. Date ……

I confirm that the conditions of the relevant Ordinance and Regulations have been fulfilled in relation to this thesis

Signature ……. Prof. John S. Rowan

Acronyms

ADMARC	Agricultural Development and Marketing Corporation
ADO	Agricultural Development Officers
CEDAW	Committee on the Elimination of Discrimination against Women
DF	Degrees of Freedom
DFID	Department for International Development (UK)
DROP	Disaster Resilience of Place
DODMA	Department of Disaster Management Affairs
EAD	Environmental Affairs Department
ENSO	El Niño-Southern Oscillation
EPA	Extension Planning Areas
FAO	Food and Agriculture Organisation (of the United Nations)
FEWSNET	Famine Early Warning Systems Network
FGD	Focus Group Discussion
FHH	Female headed household
FRELIMO	Frente de Libertação de Moçambique (Liberation Front of Mozambique)
GBP	Great British Pound
GDP	Gross Domestic Product
GECAFS	Global Environmental Change and Food Systems
GOM	Government of Malawi
HA	Hectares
HDI	Human Development Index
HHH	Household head
HIV/AIDS	Human Immuno-deficiency Virus / Acquired Immune-Deficiency Syndrome
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IPCC	Inter-governmental Panel on Climate Change
IRIN	Integrated Regional Information Networks
KG	Kilogram
KG HA	Kilogram per hectare
LGB	Larger Grain Borer
LTK	Local traditional knowledge
MEA	Millennium Ecosystems Assessment
MHH	Male headed household
MMS	Malawi Meteorological Services
MOAFS	Ministry of Agriculture and Food Security
MT	Metric tonne

MWK	Malawi Kwacha
NAPA	National Adaptation Programme for Actions
NELM)	New Economics of Labour Migration
NGO	Non-Governmental Organisation
OPV	Open Pollinated Varieties
RENAMO	Resistência Nacional Moçambicana (Mozambican National Resistance)
SE	Standard error
SLF	Sustainable Livelihoods Framework
SSA	Sub-Saharan Africa
SST	Sea surface temperature
SPSS	Statistical Package for Social Sciences
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNHCR	United Nations High Commission for Refugees
USA	United States of America

Chapter One

Introduction

1.1 Introduction

This chapter introduces the thesis by describing food insecurity as a persistent challenge in southern Africa for which innovative theoretical and policy-oriented approaches are being sought. The subsequent sections outline the aims and objectives of this thesis, as well as the background against which these are based. Thereafter, the chapter will outline the structure and composition of each one of the seven chapters that constitute this thesis.

1.2 Aims of this thesis

In the semi-arid regions of Africa drought is a recurrent phenomenon as a result of extreme variability in rainfall (Rasmusson, 1987; Elbadawi, 1998). Food insecurity is one of the most prominent impacts of drought in this region. Future climate change scenarios are indicative of increased drought incidence especially in southern Africa where food insecurity has been a persistent problem over the last few decades (Rosegrant et al., 2005; IPCC, 2007).

In response to the food security challenges presented by drought, innovative theoretical and policy-oriented approaches that address vulnerability in agriculture and build adaptive responses to climate change and other stressors are required. In recent years the resilience theory has gained prominence as one such approach with the potential for enhancing analytical understanding of food systems[1] and how they can be managed in the context of increased environmental, political and socio-economic uncertainty. Marshall (2010:37) asserts that managing food systems for resilience would enable the development of preconditions required for adaptation to climate change events and processes. A growing number of scholars, however, are warning that hasty actions to build resilience may distort the development process and produce perverse and unintended effects, including worsening vulnerability (Burton and van Aalst, 2004; Bunce et al., 2010). The theoretical and philosophical basis of the resilience approach, its meaning, measurement and application have been questioned by several scholars (Brand and Jax, 2007; Manyena, 2006; Walker and Cooper, 2011).

The aim of this thesis is to contribute a more advanced understanding of resilience. It examines the factors that make people resilient to climatic stresses, specifically drought, in the context of resource-constrained, smallholder farming communities as typified by two rural locations selected

[1]Food systems are a set of dynamic interactions between and within the bio-geophysical and human environments that result in the production, processing, distribution, preparation and consumption of food. They encompass (i)

in Malawi. The theoretical component of the study focuses on the conceptualisation and meaning of resilience, while the empirical components are practice-oriented and explore the application, measurement and assessment of resilience. This aim is achieved initially through pursuing the following four objectives:

1. Identify and describe the long term and proximate factors that underpin vulnerability to food insecurity in the study areas (tackled in Chapter Four);
2. Evaluate the role of livelihood assets and institutions in shaping coping strategies and adaptive capacity, and analyse the implications for household resilience (tackled in Chapter Five);
3. Determine the characteristics of drought resilient households and assess whether resilience is useful or not as a concept for understanding how smallholder farmers cope with adverse situations such as drought (Chapter Six);
4. In the concluding chapter to the thesis a fourth and final objective is addressed. This is to analyse the utility of the concept of resilience and to develop a schematic model illustrating the inter-relationships of vulnerability, adaptive capacity and resilience (Chapter Seven).

1.3 Background to the study

Droughts have been a part of human existence since before the beginning of crop cultivation. An estimated 20% of the earth's land mass is affected by drought at any one time (Burke et al., 2006). In combination with floods, droughts account for 80 % of loss of life and 70 % economic loss linked to natural disasters in Sub-Saharan Africa (African Union et al., 2008). In Malawi, for example, 1.7 % of Gross Domestic Product (GDP) or US$22 million is lost on average each year due to droughts and floods, and this economic loss translates to about 265,000 people sliding into poverty each year (World Bank, 2010). In Zimbabwe the 1990-91 drought led to a decline in GDP of 11 %. The Kenyan drought of 1999-2001 cost the economy US$2.5 billion. For both cases, drought impact represented significant foregone development (UN, 2008). In most of Sub-Saharan Africa, the most visible manifestations of drought are famines, food insecurity and malnutrition which are precipitated by sharp supply side declines within the agricultural production system (Benson, 1998:241; Scrimshaw, 1987).

The focus on Sub-Saharan Africa (SSA) in this thesis is particularly motivated by the fact that while drought-induced food insecurity is a universal challenge, the problem has been particularly persistent in this region (Devereux, 2009). Some 60% of SSA is vulnerable to drought and 35% is classified as highly vulnerable (Clay 1995). The Ethiopian famine of 1999-2000 led to a loss of 71,600 to 122,700 lives (Salama et al., 2001), the Malawian

famine resulted in 47,000 to 85,000 deaths in 2001-2002 (Devereux and Tiba, 2007), while the famine in Niger in 2004-2005 claimed between 13,297 and 47,755 lives (Rubin, 2009). The recent drought in the Horn of Africa, dubbed the worst in 60 years, left an estimated 12 million people in need of urgent food assistance and resulted in massive economic losses (IRIN, 2011). Scaling down, southern Africa is increasingly the focus of humanitarian food assistance with the sub-region experiencing food crises in the years 2001-02, 2002-03, 2005-06 and 2008-09 (Tschirley and Jayne, 2010:76). Projections of future trends are indicative of a high likelihood of continuation of food insecurity in Africa (Rosegrant et al., 2005).

Drought, however, is not the only driver of food insecurity in SSA. In fact, Glantz (1987) argues that drought is not the fundamental problem in SSA. He argues that any drought mitigation and adaptation measures that fail to address the underlying causes of vulnerability will only tackle superficial problems and will fail in the long term, potentially weakening long term sustainability. As Parry and Carter (1998) note, drought and climate change should be understood in the context of broader economic and social conditions, and the extent to which these create resilience or vulnerability to the impacts of drought or climate change. Moreover, understanding and addressing drought through mitigation and adaptation strategies calls for inter-disciplinary and systems-oriented approaches (Clay, 1998).

1.3.1 Predictions of future food security

The risk of global food insecurity is expected to increase as a result of the complex and multi-scale interactions of drivers and feedbacks that govern food systems, such as global population growth; westernisation of diets in the fast industrialising economies of Brazil, India and China, diversion of agricultural land and produce towards biofuel production with global environmental change, and chiefly climate change (Godfray et al., 2010; Foresight, 2011; Pingali, 2004; Escobar et al., 2009; Naylor et al., 2007:31).

Forecasting into the future, Rosegrant et al. (2005) predict that food security in southern Africa is likely to diminish despite modest increases in agricultural production if current policy choices and investments in agriculture continue. Their pessimistic scenario for the period 1997 to 2025 considers challenges such as lack of sound governance, HIV/AIDS, soil infertility, poverty, poor infrastructure, limited access to developed country markets, limited access to irrigation and low investment in agricultural research, as likely to limit agricultural productivity and food security in the continent. They argue that while agricultural production may increase modestly by 2025, along with increased calorie consumption, the absolute numbers of malnourished children under the age of five, a proxy for food insecurity, could increase substantially from 32.7 million in 1997 to 38.3 million in 2025, despite the percentage drop from 32.8 % to 28.2 % over the same period.

Among the most prominent factors that will exacerbate future food insecurity is climate change. Several scientific studies concur that climate change will impose profound effects on all four components of food security: food availability, food accessibility, food utilisation and food stability (Easterling et al., 2007; Parry et al., 2007; Stern, 2007; Nelson et al., 2009; Jones and Thornton, 2008; Twomlow et al., 2008). According to Easterling et al. (2007), even slight warming will decrease agricultural yields in the seasonally dry and low latitude regions. In addition, it is anticipated that societies dependent on natural resources will be particularly affected by the effect of hastened biodiversity loss and reduced productivity of fisheries and forests due to climate change (MEA, 2005; Badjeck et al., 2009).

1.3.2 Academic and policy implications of predicted food security trends

Considering the above factors, it is imperative that dramatic transformations are made to food and agriculture policy to ensure that food systems can adapt successfully to climate change while also taking into account the effect of environmental and socioeconomic changes. As discussed in earlier sections, food systems are affected by multiple stresses that operate across varying spatial, temporal and institutional scales, and from micro to macro levels that are characterised by both high uncertainty and high unpredictability (Ericksen et al., 2010). In light of the diversity, complexity and persistence of the highlighted problems, adopting resilience as both

thought organising framework and goal in food system management has been largely promoted as an apt approach for enabling successful coping with uncertainty and adaptation to change (Folke, 2006). Resilient systems have capacity to buffer disturbance, self-organise and learn and, therefore, cope successfully with surprises and adapt to change (Carpenter et al., 2001; Holling, 2001). Through strengthening resilience while reducing vulnerability to multiple stresses, adaptive capacity is produced and maintained (Adger, 2000:347).

1.4 Structure of this thesis

Chapter One has outlined the aims and objectives of this thesis and also provided the background against which these objectives had been formulated. Chapter Two provides a critical review of literature on the concept of resilience. This chapter initially focuses on the conceptualisation of resilience as applied by scholars across academic disciplines; highlights some of the criticisms levelled against the resilience theory; and defines the system (food system) and stressor (drought) that are studied in this thesis in order to answer different questions relating to resilience. The chapter then proceeds to examine the relationship between resilience and two other concepts, vulnerability and adaptive capacity, which are tightly linked to resilience. Thereafter, the Sustainable Livelihoods Framework which links assets and institutions to vulnerability on one end and attainment of

wellbeing goals on the other is used to assess the determinants and indicators of resilience. On the basis of the understanding of resilience developing from this chapter, a conceptual model and research questions that are subsequently applied to the study areas are produced.

Chapter Three is an account of the approach and methods adopted by the current study. It describes how the study locations and respondents were selected, the data collection and analysis methods used, the limitations of the study and the various issues relating to the researcher's positionality that should be taken into account when drawing conclusions based on the results of the current study.

Chapters Four, Five and Six are the results chapters. They have been organised around the first three objectives of the study. Chapter Four focuses on the long term and proximate factors that shape vulnerability in the study areas. It describes the manifestation of vulnerability to drought induced food insecurity in the study areas, identifies the factors that account for the observed vulnerability, and links vulnerability to resilience with an aim of establishing a new way of thinking about how these two concepts could be related.

Chapter Five focuses on adaptive capacity. It examines the contribution of livelihood assets and institutions to coping and adaptive capacity. By relating ownership of the various livelihood assets to response capacity in the face of drought and other stressors the chapter seeks to examine the

extent to which livelihood assets contribute to adaptive capacity of a system as well as its resilience.

Chapter Six presents results on the determinants of resilience to drought. The resilient households are derived from applying the attributes of resilient systems on the local context, as defined by markets, policy, institutions and technology.

Chapter Seven discusses the findings of this thesis in light of the existing scholarly thought in order to draw out the contribution of this thesis to the advancement of the resilience theory. The chapter also presents a revised version of the conceptual model for analysing resilience in food systems (based on the model presented in Chapter Two) based on an understanding of the relation between vulnerability, adaptive capacity and resilience. Recommendations for policy makers and practitioners are made, and areas for future studies signposted.

Chapter Two

Literature Review

2.1 Introduction

Building resilience in the context of human responses to disasters has gained increasing currency in recent years. The resilience approach has been applied by studies on the societal impacts, responses and recovery from disasters across diverse fields of inquiry including the September 11 terrorist attacks in the USA in 2001 (Allenby and Fink, 2005; Durodie and Wessely, 2002); East Asian tsunami in 2004 (Paton et al. 2007; Rajkumar et al. 2008); Hurricane Katrina in the USA and surrounding island nations in 2005 (Edwards, 2010; Colten et al. 2008); the global financial crisis of 2008 (Didier et al. 2011) and the earthquakes in Haiti and Japan in 2010 and 2011, respectively (Lindell, 2010; Deshmark and Hastak (2009).

In the wake of the impacts of the global food crisis of 2008 and, more recently, the catastrophic humanitarian and economic impacts of the East African drought in 2010, the famine in the Horn of Africa in 2011 to 2012 as well as the protracted food crises in southern Africa since the turn of the century, governments and donors have directed increasing attention to resilience building as a promising approach to delivering human development targets, including food security. Resilient coupled systems of

human and natural processes (or socio-ecological systems), such as agriculture, are perceived to have enhanced capacity to adapt to uncertainty.

In support of the resilience approach, the UK Department for International Development (DFID) has committed to build disaster resilience into all its programmes by 2015 (DFID, 2011:14). The government of Malawi's National Adaptation Programmes of Action report identifies "increasing resilience of food production systems to erratic rains by promoting sustainable *dimba*[2] production of maize and vegetables in *dambos*, wetlands and river valleys" as one of its top two highest priorities for adaptation to climate change (EAD, 2006:9). These two examples demonstrate growing support for the resilience approach. However, a critical evaluation of whether, why and how the resilience approach could be more successful in resolving underlying problems such as food insecurity in comparison with other approaches that have been used in the past is necessary. Bunce et al. (2010) demonstrate the relevance of resolving this conundrum to adaptation processes. They argue that some of the actions taken to build resilience have had unintended consequences, including exacerbation of vulnerability. Gwimbi (2009) argues that it is important that the resilience concept is contextually better understood before practical implications can be drawn about resilience across scales

[2]Dimba or dambo refers to pieces of land used for winter crop cultivation primarily on the basis of residual moisture that characterises areas bordering streams and rivers (Peters, 1996; Kambewa, 2005).

Chapter Two critically reviews literature on the concept of resilience. It initially focuses on the definition of resilience derived from the different attempts to apply the concept. The second section defines the focal area within which resilience will be analysed in this thesis by describing the food system. Drought will be identified as a substantial stressor for which food systems require resilience. The third section introduces the sustainable livelihoods framework and identifies some of the asset-based indicators that have been used in previous studies. The chapter concludes with a set of research questions based on gaps emerging from the literature review.

2.1 Contrasting perspectives on Resilience

The review of the various definitions of resilience in this section should be understood in the context of on-going processes aimed at developing a resilience "theory" and the need to develop frameworks that enable practical application of resilience thinking.

A comprehensive definition is offered by Walker et al. (2004:2) who define resilience as "the capacity of a system to absorb disturbance and reorganise while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks". In the context of agriculture, Falkenmark and Rockström (2008:101) define resilience as the ability of the agricultural system to rise and continue to develop after experiencing a shock such as drought. They contend that a resilience perspective shifts the focus from concerns about growth, yield optimisation or efficiency in the production

system, in favour of capacity to adapt, recover, develop and remain flexible. Thus, a resilient system has capability for self-organisation and adaptability to changing conditions (Carpenter et al., 2001).

An understanding of the resilience of a system should encompass the following four aspects: (1) the maximum amount of change that a system can undergo before crossing the threshold beyond which capacity to recover is difficult or impossible; (2) the level of ease or difficulty with which a system can be changed; (3) the precariousness of a system, or how far the system is from reaching its tipping point; and (4) the different scales, boundaries and dynamics that influence the system's resilience (Walker et al., 2004:2).

The definition of resilience given above does not capture the full diversity of conceptualisations of resilience found in different disciplines. Scholarly work on resilience acknowledges the existence of multiple definitions and meanings attached to resilience (Brand and Jax, 2007; Carpenter et al., 2001). These definitions are, however, not in conflict, but all attempt to describe the same phenomenon, that is, the ability to successfully cope with adversity. The main attributes of resilience emerging from the literature are: stability, resistance and persistence; recovery capacity; transformability; learning capacity, flexibility; and self-organising capacity. The following section looks at each of these attributes in turn.

2.1.1 Resilience as stability and persistence

As a technical concept in ecology, resilience was introduced in the seminal work by Holling (1973) to describe the return to stability of ecological systems following perturbation. Holling defined resilience in terms of the persistence of relationships within a particular system despite disturbance. In this sense, resilience was seen as a measure of a system's ability to absorb changes and to still persist (Holling, 1973:17). Holling argued that ecological systems were predictable on one hand, tending to operate at or near a stable equilibrium, to which they returned following perturbation; and unpredictable on the other hand, due to the existence of multiple stable equilibria where instability could have the effect of shifting a system into another regime (Holling, 1973; Gunderson, 1999:3). In this latter case, resilience is therefore, conceptualised as the magnitude of disturbance that can be tolerated before a socio-ecological system moves to a different regime controlled by a different set of processes (Gunderson and Holling, 2002; Resilience Alliance, 2007).

The definitions above suggest that resilience is observed after a system has faced a disturbance. Further, the definitions tend to judge against a null effect in which a system is either resilient or not depending on its capacity. Operationally, it is not clear whether resilience may be observed prior to disturbance, which could be a sound basis for rescuing a system from predicted harm, or if there are cases where having low tolerance or

resistance may in fact promote a system's capacity to develop despite adversity.

From a more social perspective, resilience is defined as the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change, and withstand external shocks to their social infrastructure, such as environmental variability or social, economic and political upheaval (Adger, 2000). This definition of resilience embraces the diversity of sources of disturbances, thereby suggesting a need for multi-disciplinary approaches to understanding resilience. In studies of socio-ecological systems, non-material attributes or qualities like endurance, human spirit, hope and tolerance which potentially explain social resilience thresholds through their influence on human behaviour, have received little academic attention.

2.1.2 Resilience as recovery

Resilience as capacity for recovery focuses on the ability to "bounce back" and "self-organise" following a change or stress. Pimm (1984:2) defines resilience as "how fast the variables return towards their equilibrium following a perturbation". This notion of return time to stability is also known as "engineering resilience" (Holling, 1996). Walker et al. (2004) argue that engineering resilience should not be considered as *the* measure of resilience. They argue that in examining the extent to which a system can be changed, or its resistance, return time does not measure the different ways in

which a system may fail, either temporarily or permanently, to retain essential functions and feedbacks. In practical terms, the return time to stability notion may be problematic as there are no clear boundaries of what a reasonable time frame is given inequalities in resource access in social systems. Furthermore, this definition assumes desirability of the initial state, which may not be always true e.g. in the case of poverty or ruthless regimes. In addition, Simbienda (2010) puts it in the context of some disasters(e.g. volcanic eruptions) where the landscape may be altered to the extent where there is literally nothing to return to and therefore, the whole conception of "returning" to the initial environment is an impractical yardstick for measuring resilience.

From the hazards perspective, Timmerman (1981) defines resilience in terms of a system's or part of a system's capacity to absorb and recover from the occurrence of a hazardous event. This definition links resilience to vulnerability of a system, an issue further considered by Blaikie et al. (1994) in their definition of vulnerability, where vulnerability is defined by three components: exposure, resistance and resilience, with resilience being the ability of an actor to cope with or adapt to a hazard stress. According to Blaikie et al. (1994), resilience is a product of the degree of planned preparation undertaken in the light of a potential hazard, including relief planning and rescue. The inclusion of relief and rescue by Blaikie and others raises the question of the boundaries of the system within which resilience should be assessed. For example, should organisations external to the

community be considered as part of what makes these communities resilient, or should resilience in the context of development be seen from a purely self-sufficiency viewpoint?

A very useful insight provided by Timmerman (1981) and Blaikie et al. (1994) is their consideration of resilience at system and sub-system levels or analysis of resilience at the scale of the individual or household. Such local level analysis creates opportunities for incorporation of resilience perspectives from the cognitive sciences into socio-ecological research. In food systems research, there is sometimes a lack of clarity on who is tasked with transforming a food system when the current state is deemed untenable (Ericksen et al., 2010).

2.1.3 Resilience as transformability

Transformability is "the capacity to create a fundamentally new system when ecological, economic, or social (including political) conditions make the existing system untenable" (Walker et al. 2004:3). Resilience as transformability refers to the capacity of systems to respond to change adaptively. Resilience is seen as not necessarily involving return to a pre-existing state, but includes the possibility of a new state that is more sustainable in the new environment. Change, in this case, is perceived as inevitable rather than as a stressor. Renewal, regeneration and reorganisation are the guiding principles for this conceptualisation of resilience (Folke, 2006).

While Walker et al. (2004) consider transformability as one of the three attributes (the others being adaptability and resilience) that govern a system's dynamics and determine its future trajectories; here transformability has been considered as a sub-set of resilience. Transformability defines the ease with which a system can be changed from one state to an alternative state. Unlike the stability and recovery definitions of resilience which emphasise return to a stable equilibrium and perceive disturbances as entirely negative, the transformation and transformability perspective consider disturbances as potentially useful in fostering positive changes. Antonovsky and Bernstein (1986) point out that stresses may positively challenge individuals and communities thereby giving rise to successful coping precisely because it makes unprecedented demands. The Chinese symbol for crisis is a composite of two pictographs; one is for danger and the other for opportunity (Walsh, 1998:269) reflecting that crisis is an opportunity to build better and stronger. An example of communities shaping their trajectory of change following adversity is provided by Cumming (1999 in Walker et al., 2004). He describes how severe drought in the 1980s in south-eastern Zimbabwe following decades of cattle ranching that degraded the rangeland triggered transformation from many individual cattle ranches to a few wildlife conservancies where all livestock and fences were removed and managed collectively for tourism and hunting.

In assessing the view of resilience as recovery, it has been argued that some initial states such as polluted water supplies, dictatorships and system states

that decrease welfare (Carpenter et al. 2001:766), are not worth bouncing back to. In such cases, transformation is a formidable option. However, it appears that there is less attention given to the undesirable or negative states in the wider conceptualisation of resilience. Transformability as resilience importantly recognises that the new system should not compromise long term prospects. The DFID definition of resilience in the context of disasters states that:

> *"Disaster resilience is the ability of countries, communities and households to manage change, by maintaining or transforming living standards in the face of shocks or stresses-such as earthquakes, drought, and violent conflict-without compromising their long-term prospects"* (DFID in Twigg, 2007:5).

If a population group is able to maintain or positively transform its living standard despite adversity, then it may be considered as resilient. This definition differs slightly from other perspectives that see livelihoods as the object of transformation, and better living standards as an outcome of resilient systems.

2.1.4 Resilience as learning

Recent literature recognises that resilience goes beyond absorbance of disturbance, reorganisation of systems into their full functionality or their return to a state or multiple states following a disturbance, to include advancement of systems through learning from the experience of disturbance (Adger et al., 2005; Klein et al., 2003; Folke, 2006). In comparison

with ecological systems, humans have capacity to learn and anticipate disturbances. Garmezy (1994, in Saleebey, 1996:298) defines resilience as the skills, abilities and knowledge that accumulate over time as people struggle to surmount adversity and meet challenges and can be used to meet current struggles. In considering communities facing persistent food insecurity due to drought, one may question the extent, processes and conditions within which learning may actually contribute to positive or negative outcomes.

Resilience as learning may be considered in two forms: reactive and proactive. Reactive resilience occurs where a social unit approaches the future by strengthening the status quo and making the present system resistant to change. Proactive resilience, on the other hand, accepts the inevitability of change and attempts to create a system that is capable of adapting to new conditions and imperatives (Dover and Handmer, 1992). This typology illustrates a fundamental difference between ecological and socio-ecological systems, where the latter have capacity for both anticipation and learning. The degree to which a system can build capacity to learn and adapt is a fundamental component of that system's resilience (Carpenter et al., 2001).

2.1.5 Resilience as self-sufficiency

The Hyogo Framework for Action (2005-2015) defines resilience as the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and

efficient manner (United Nations International Strategy for Disaster Reduction, 2005). From within the same school of thought, Twigg (2007) argues that focusing on resilience in the context of the Hyogo Framework emphasises a focus on what communities can do for themselves and how to strengthen their capacities, rather than concentrating on their vulnerability to disaster or environmental shocks and stresses, or their needs in an emergency.

The notion on "what communities can do for themselves" ushers in the self-sufficiency dimension of resilience, and a key property of self-sufficiency is capacity to self- organise in anticipation of, or response to, a hazard. This notion raises questions about who determines what resilience is and is not, and the measures to be taken to rate a community as resilient (based on self-sufficiency) when the nature of future risks is not fully known. While a community may have mechanisms for dealing with disasters at community level, household level differences mean that some will better survive a disturbance than others; and differences in access to resources are expected with differences in social power. From a psychology perspective, protective factors are seen as critical in determining resilience. Kaplan et al. (1996:158) define resilience as "presence of protective factors (personal, social, familial, and institutional safety nets)" which enables individuals to resist life stress.

Social protection may be a key ingredient for enabling successful coping and adaptation. However, a growing number of scholars question the role of social protection mechanisms, government and NGO policy and

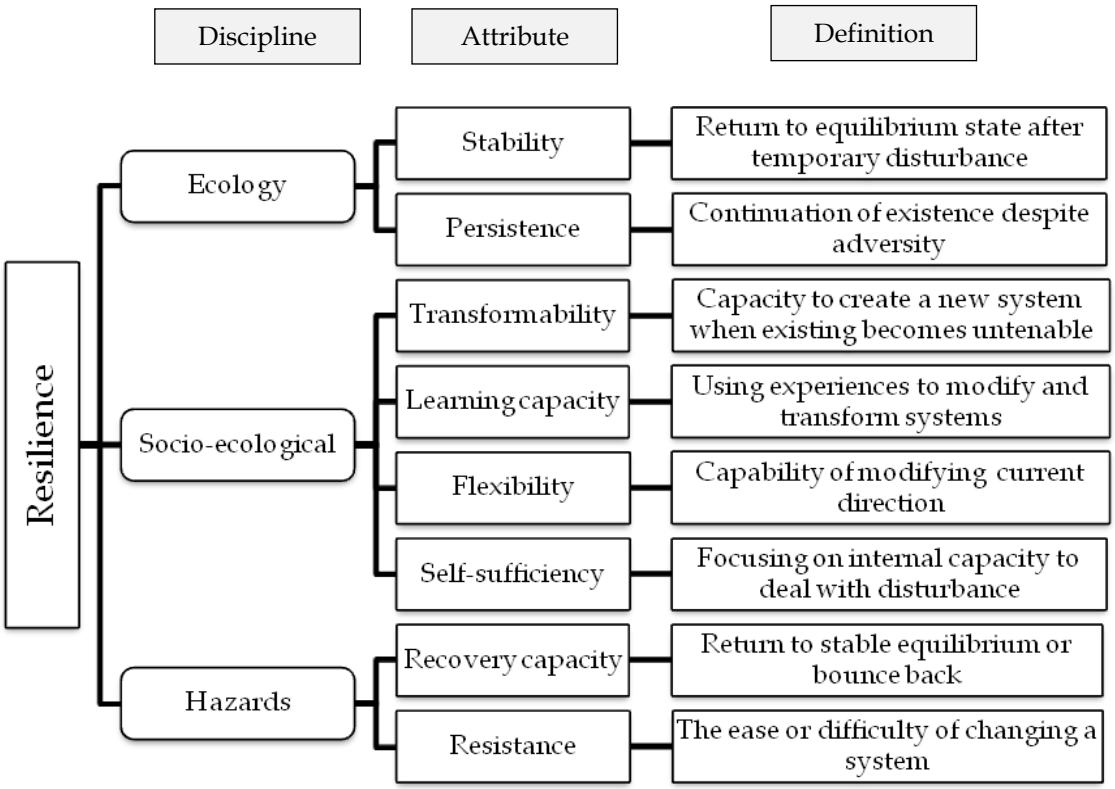
interventions in contributing to resilience (e.g. Bunce et al., 2011; Adger et al., 2011). One may question whether resilience may be built within a community within a three year programme. In this case, one would raise questions about the basis for judging whether the goal of resilience has been achieved at all. From a management perspective, should the goal be to build resilience, or should the focus be on more attainable and measurable outcomes?

2.1.6 Resilience as flexibility

Pickett et al. (2004:381 in Brand and Jax, 2007:23) define resilience as flexibility over the long term. As an attribute, flexibility has received considerably less attention than others, such as recovery and transformation. The application of flexibility has been confined to understanding management systems. Gunderson (1999) argues that adaptive management in the context of surprises can only be achieved with resilience in the ecological system and flexibility in the extant power relationships among stakeholders. In this case, flexibility and resilience are seen as complimentary properties, rather than one being a property of the other. It is argued here that in human systems, flexibility should also include markets, rules and rule making systems, norms, values and taboos that shape adaptive management.

To summarise, the different conceptualisations of resilience can be synthesized in **Figure 2-1**. This seeks to represent the main attributes of

resilient systems and the generic definitions promoted by different disciplines.



Source: Author, 2012

Figure 2-1: Schema showing the attributes of resilient systems

2.2 Conceptual limitations of resilience thinking

Despite increased application in the study of ecology, social ecological systems, and hazards, resilience thinking has been challenged on conceptual and practical grounds (Brand and Jax, 2007). It is argued that the concept of resilience has gained currency in the absence of philosophical dimensions and clarity of understanding, definition, and substance. Most importantly, its applicability in management and sustainable development remains unclear

(Manyena, 2006:435). In the course of its evolution, the concept of resilience has been subject to multiple definitions within and across disciplines. This 'over-definition' has resulted in vagueness of the concept, making its use and application confusing and impractical (Twigg, 2007; Walker et al., 2004; Manyena, 2006). Other scholars have described resilience as being of dubious scientific value (Luthar et al., 2000:543), under-theorised (Walker and Cooper, 2011) and ambiguous (Shultz, 2012). On practical relevance, Cummings et al. (2005) argue that the multidimensionality associated with the concept makes it difficult to operationalize, and the variables that should be measured to evaluate resilience are not always clearly articulated.For resilience scholars and practitioners, there are confusing perspectives in terms of whether resilience is a state, a process or an outcome (Kaplan, 1999) or whether it is the flip side of vulnerability (Gallopin, 2006; Gaillard, 2007).

Academic arguments on the philosophical basis and conceptual validity of 'resilience' have, however, failed to reconcile the resilience discourse with etymology. The Etymology Dictionary states that the term resilience has been in use since the 1620-1630s and stems from the Latin word '*resilire*' which means to spring back or rebound. While the academy may advance the resilience discourse, it cannot claim that common language use of the term resilience is based on weak theorisation. Thus, the multiple meanings of resilience should be taken into account particularly in research focusing on societal concerns. In other words, it should be understood how and by whom the discourse, as it relates to what it means to be resilient, is

influenced. It is clear, therefore, that a practical approach to understanding and assessing resilience in social-ecological systems is needed (Bennett et al., 2005). In light of the definitions of resilience reviewed, the challenges associated with the current conceptualisations of resilience are discussed.

2.2.1 The challenge of conceptual clarity

In the search for a well-grounded theory of resilience, there is a debate on how precise the definition of resilience should be. The ambiguity of the concept of resilience appears to have precipitated its many definitions including those that were discussed in the previous section. By being ambiguous, resilience as a concept has been subject to multiple interpretations which have facilitated cross-disciplinary applicability. It may also be argued that through promoting a systems way of thinking, resilience has improved knowledge on processes governing various systems. Criticism of the concept, therefore, should be considered against the benefits that the vagueness of the concept has produced. In support of conceptual ambiguity, Ludwig Wittgenstein (1904) is quoted as follows:

> *"'Is a blurred concept a concept at all? Is an indistinct photograph a picture of a person at all? Is it even always an advantage to replace an indistinct picture by a sharp one? Isn't the indistinct one often exactly what we need?"'*
>
> (Ludwig Wittgenstein, Philosophical Investigations, §71, cited in Strunz, 2012)

Ludwig's view (Strunz, 2012:112) suggests that balancing the trade-offs between conceptual vagueness and the purpose for which the concept is being used potentially enhances what can be known about a particular system. In support of conceptual vagueness, Strunz (2012:115) argues that vagueness of concepts allows for inter and trans-disciplinary communication. Recent inter-disciplinary scholarly work on resilience in socio-ecological systems appears to have been possible owing to the absence of highly concise definitions. Lambin (2005, in Folke, 2006:260) acknowledges that the resilience approach offers an opportunity for generating integrative science and interdisciplinary collaboration around vulnerability research, ecological economics and sustainability science towards tackling some of the world's most pressing challenges.

2.2.2 Weak inter-disciplinary integration with behavioural sciences

There is an increasing volume of studies into resilience in socio-ecological systems indicates some level of successful coupling of ecology and sociology in research (Adger, 2000; Klein et al., 2003; Keil et al., 2008; Gwimbi, 2009; Falkenmark and Rockstrom, 2008; Fenton et al., 2007., Marshall et al., 2007).

However, less success has been realised in fostering the integration of resilience principles between the discipline of psychology and either ecology or socio-ecological systems research. In fact the latter disciplines have, to a large extent, failed to adequately acknowledge that the concept of resilience has deep roots in psychology and that there are areas of mutual interest

between these disciplines. A Web of Knowledge search for articles containing the term "resilience" published between 1950 and 2012 revealed that 25% (or 8499) of the 34 684 articles published were from the fields of psychology, psychiatry and behavioural sciences (Author, 19/11/2012). Despite the substantial contribution from psychology, though such work into resilience as that conducted by Garmenzy and others working in the field of clinical psychology (e.g. Garmenzy, 1971, 1974; Werner, Bierman and French, 1971; Murphy and Moriarty, 1976; Luthar et al., 2000), scholarly work on resilience in ecological and socio-ecological has yet to acknowledge the role played by the cognitive sciences in the evolution of the concept of resilience. In early research into resilience, the concept was used in psychology to explain differences in adaptive behaviour among individuals (e.g. children, drawn from deprived neighbourhoods and faced with adverse life situations, such as parental mental illness and alcoholism). This and other related principles have received limited attention in the framing of resilience within socio-ecological research.

2.2.3 Ineffective scales of analysis

Resilience in social ecology and hazards research is generally understood at the scale of the community because resilience is sensitive to the institutional context (Twigg, 2007; Cutter, 2008; Adger, 2000). While the institutional context is unarguably important in determining resilience outcomes, it could be suggested that the impacts of climate change and other stressors are directly felt at individual and household levels. Decision making, asset

ownership and response strategies that shape resilience occur at this scale. The role of individual actors and the forces that shape their attitudes towards risk and motivation to protect, learn from experience and transform their livelihoods may not be well articulated at community scale. The fact that psychological studies focus on resilience at the scale of the individual, suggests that there is potential value in coupling psychology and research into social ecology. By focusing at the system level and less on individuals or specific actors, there is limited scope for exploration of the role of the agency that people have at individual or collective level in shaping resilience or the 'resilience of the human spirit' in the face of trauma (e.g. drought), in determining such desirable outcomes as maintenance of food security under adverse conditions.

Despite the general neglect of psychology literature in the study of socio-ecological systems, an increasing body of literature on the links with the hazards paradigm has been established. Paton and Johnston (2001) explore the factors undermining the effectiveness of traditional approaches to public hazard education. Their study concludes that the failure to incorporate community, social and psychological factors that facilitate the relationship between risk perception and risk reduction behaviour has contributed to minimal impact achieved by measures seeking to build natural hazard preparedness. Ronan et al. (2001) outline a model for predicting the causal relationship between cognitive factors and individual preparation for natural hazard effects.

Grothmann and Patt (2003; 2005) level criticism against the neglect of motivation and perception of adaptive capacity in climate change adaptation literature. Their study applies the Protection Motivation Theory (after Rogers, 1975 and 1983; Rogers and Prentice-Dunn, 1997) to investigate the effects of risk perception on likelihood of exhibiting protective behaviour when faced with flood risk in Germany or drought risk in Zimbabwe. The above studies demonstrate the applicability and potential value that could be achieved with a framework integrating the hazards, socio-ecological and psychology disciplines.

The temporal, social and spatial scale within which resilience is being analysed is also very important for objective assessment of resilience. Carpenter et al. (2001:767) point out that while a socio-ecological system can be resilient at one time scale because of certain features (e.g. technology use), it may fail to maintain that resilience over the long term as the context within which the system is operating changes or is compromised. Since resilience at only one time may be achieved at the expense of future resilience, to measure resilience, one should specify the time and spatial scales of interest on the basis of the nature of the disturbance being considered.

2.3 Resilience of what to what

The main objective of the present study is to identify the factors that determine resilience. It is envisaged that through exploration of these factors,

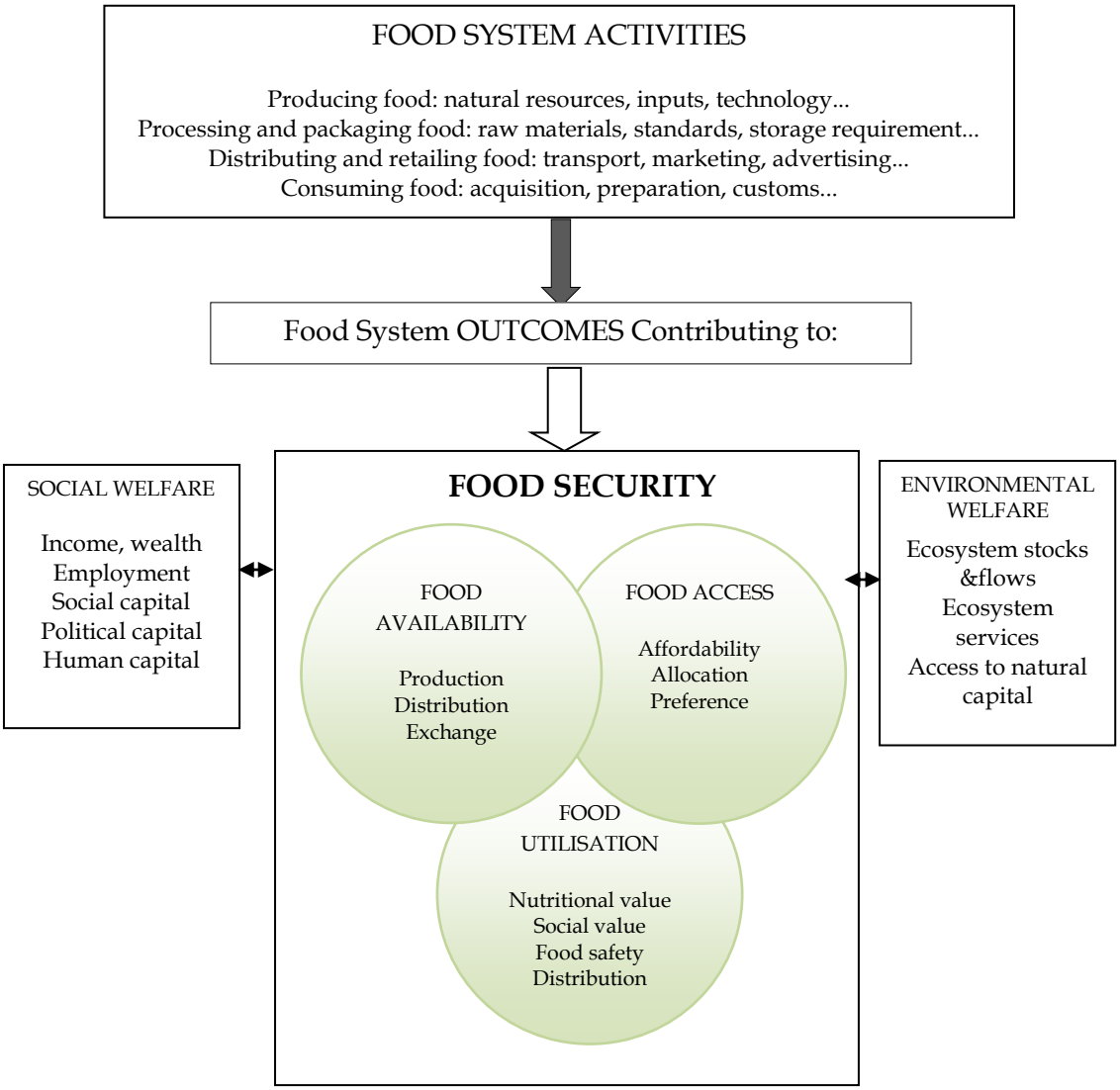
a contribution to a better understanding of the concept of resilience and how it can be applied in practice could be accomplished. The key step towards understanding resilience of a system is to identify and define the system. Secondly, the disturbance or shock or other change for which resilience is being assessed needs to be clarified (Bennett et al. 2005:946; Carpenter et al., 2001). According to Carpenter et al. (2001), resilience should be described in terms of resilience of what to what. Given that food security is the outcome of primary interest in this thesis, the food system is described in the following section as an example of a socio-ecological system. In the context of Sub-Saharan Africa, which encompasses the study's location, drought is identified as one of many factors that affect the capacity of food systems to deliver food security.

2.3.1 The Food System

Food systems are coupled systems of humans and nature which underpin food security. From the perspective of GECAFS, a food system is a set of dynamic interactions between and within the bio-geophysical and human environments which result in the production, processing, distribution, preparation and consumption of food. Food systems encompass three components, which are: (i) food availability (based on production, distribution and exchange of food); (ii) food access (dependent on affordability, allocation and preference) and (iii) food utilization (encompassing the nutritional and social value of food as well as its safety)

(GECAFS, 2005:9; Gregory et al., 2005:2139). These three components of food systems and related values (**Figure 2-2**) underpin food security. Thus, food security exists when 'all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life' (FAO 1996). In addition to underpinning food security, food systems contribute to social and environmental welfare (Ericksen, 2008).

Food insecurity is experienced when food systems are stressed (Gregory et al., 2005:2141). Stress on food systems may be due to the interactions between and within the bio-geophysical and human environments, for example, global environmental change, conflict, food market fluctuations, trade protocols and epidemics, among others (Drimie et al., 2011:170). This thesis considers food systems at the scale of the household while taking into account interactions with the community food system. The community food system (Gillespie and Gillespie, 2000:2) is applicable in cases where a subsistence farmer produces, processes and consumes food on farm. However, because it is often impractical to be totally self-reliant, these food systems recognise element of bartering, exchange or the cash economy to bring food into the household (Gregory et al., 2005: 2141).



Source: Ericksen, 2008

Figure 2-2 Food systems framework

According to GECAFS, the food systems framework enables an analytical understanding of why food systems do not always deliver food security, e.g. (as a result of global environmental change), and helps in the identification of potential adaptation options that promote food security.

Food security is a difficult concept to define and measure (Maxwell et al. 2008:533). The concept is mainly studied at the household level in relation to

availability, accessibility and utilisation of food, as well as on the frequency of use and severity of coping strategies (Coates et al., 2006; Webb et al., 2006; Maxwell et al. 1999, 2008). To identify the surrogates for measuring food security, the following definitions for its three components were used:

(a) Food availability refers to the physical adequacy of supply of food for consumption at household level in terms of amount, type and quality. Food availability is achieved through production, distribution and exchange. Stock levels and net trade are thus important attributes of availability.

(b) Food access implies that although food may be physically available at the local to national and international levels, food security may not be achieved unless the food consumption unit (e.g. household) has sufficient means (power, income) to obtain access to this food. Income levels, expenditure patterns, market proximity and affordability of food (prices) are key variables for consideration of food access. The emphasis of access is that food should be affordable, appropriately allocated and meet the preferences of populations considered.

(c) Food utilisation refers to the nutrients received from the consumed food. The focus is on the nutritional, safety and social value of food. Feeding practices, food preparation, dietary diversity and intra-household food distribution are important factors considered by the current study.

Table 2-1: Indicators of food insecurity

Food Security Component	Indicator
Food availability	Main source of food Proportion of food from own production Duration with food based on household farm production Crop productivity indicators (maize) at household level Distress food transfers
Food accessibility	Household income availability Proportion of income spent on food Distance to nearest food market Perception of accessibility of market
Food utilisation	Staple food consumed by household Range of crops cultivated Dietary diversity Incidence of malnutrition
Food stress coping strategy	Reduced food consumption Reliance on less preferred food Restricted consumption Socially unacceptable distress food sourcing Distress food purchases

Source: Author, 2010

Boundaries of the system to which reference is being made should be clarified so that measurements taken may be better understood. Carpenter et al. (2001) suggest that political boundaries, catchment areas, and livelihood zones may be considered in such spatial demarcation. Since resilience is dynamic, specifying the time period within which the system's resilience is being evaluated is also important.

2.3.2 Drought

There is no single acceptable and clear definition of drought. Wilhite and Glantz (1985) conclude that drought definitions may be relatively vague or specific as used operationally to define onset, severity and termination. In general, drought is an insidious hazard of nature that originates from a deficiency of precipitation over an extended period of time, usually a season

or more (Wilhite and Glantz, 1985; McKay et al., 1989:74). On the basis of operational definitions of drought, there are four principal disciplinary groupings: meteorological, agricultural, hydrologic, and socio-economic. A meteorological drought is experienced when precipitation duration and or intensity is substantially diminished. Agricultural drought occurs when soil moisture is inadequate to meet the needs of a particular crop at a particular time. Hydrological drought refers to deficiencies in surface and subsurface water supplies. Socioeconomic drought occurs when physical water shortages start to affect the health, well-being, and quality of life of the people, or when drought starts to affect the supply and demand of an economic product (Wilhite and Glantz, 1985; Zamani et al., 2006; Moghaddas-Farimani and Hosseini, 2004). A comprehensive list of the social, environmental and economic impacts of droughts by Vogel et al (1999) is provided in **Table 2-2** overleaf.

Unlike other natural hazards, like floods, earthquakes and hurricanes, the damage caused by drought is non-structural but spread over large geographical areas. Droughts are also a slow onset disaster, and because of their creeping nature, people are generally not aware that they are in the midst of such an event. Effects of drought, on the other hand, may persist for years after the drought has ended (Watts and Bohle, 1993; Wilhite, 2000 in Hosseini et al., 2009:190; Wilhite et al., 2007). Droughts vary in their characteristics and impacts. The occurrence of drought is a function of timing (e.g. main season of occurrence, delays in start of season, occurrence of rains

in relation to crop growth stages) and effectiveness of rains (e.g. rainfall intensity, number of rainfall events) (Wilhite et al. 2007).

Table 2-2: Effects of drought in southern Africa

Primary Impacts	Secondary Impacts
	SOCIAL
Disrupted distribution of water resources	Migration, resettlement, conflicts between water users
Increased quest for water	Poverty, unemployment
Marginal lands become unsustainable	Overstocking; reduced quality of living
Reduced grazing quality and crop yields	Reduced or no income
Employment lay-offs	Malnutrition and famine; civil strife and conflict
Increased food insecurity	Public health risks
Increased pollutant concentrations	Social unrest, distrust
Inequitable drought relief	Increased threat to human and animal life
Increased forest and range fires	Social pressure, reduced safety
Increased urbanisation	
	ENVIRONMENTAL
Increased daytime damage to natural habitats	Loss of biodiversity
	Reduced income and food shortages
Reduced forest, crop, and range land productivity	Lower accessibility to water
	Plant scorching
Reduced water levels	Increased fire hazard
Reduced cloud cover	Crop withering or dying
Increased daytime temperature	Increased soil erosion; increased air pollution
Increased evapotranspiration	
More dust and sandstorms	Desertification and soil degradation (top erosion)
Decreased soil productivity	
Decreased water resources	Lack of water for feeding and drinking
Reduced water quality	More water borne diseases
	ECONOMIC
Reduced business with retailers	Increased prices for farming commodities
Food and energy shortages	Drastic price increases, expensive imports/substitutes
Loss of crops for food and income	
Reduction if livestock quality	Increased expense of buying food, loss of income
Water scarcity	
Loss of jobs, income and property	Sale of livestock at reduced market price
Less income from tourism and recreation	Increased transport costs
	Deepening poverty; increased unemployment
Forced financial loans	
	Increased capital shortfall
	Increased debt; increased credit risk for financial institutions

Source: Adapted from Vogel, Laing and Monnik, 1999

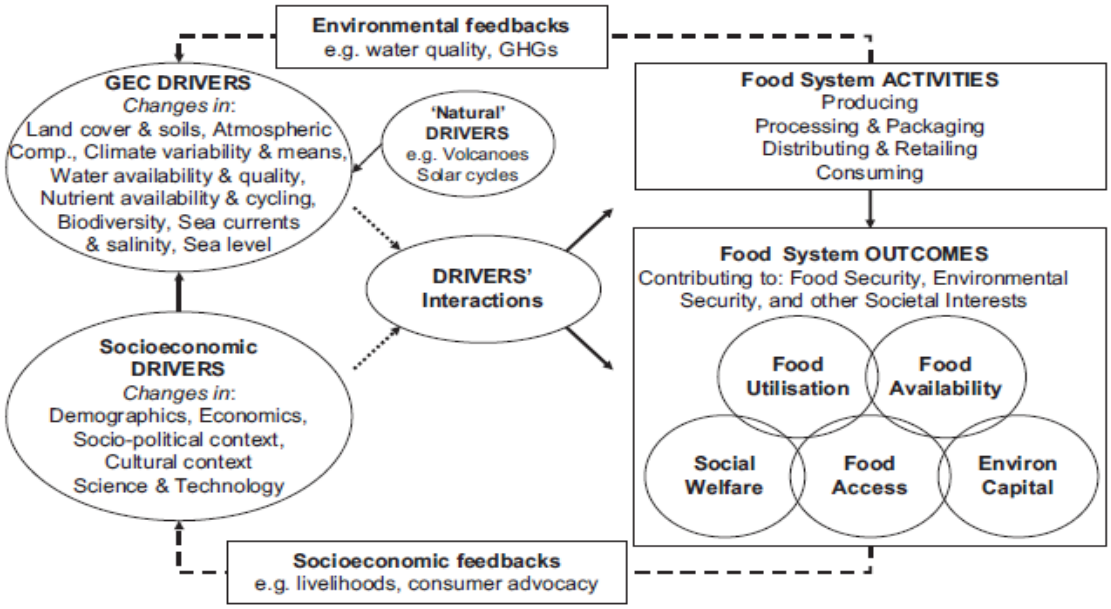
Dai (2011) asserts that droughts are caused by anomalies in the tropical sea surface temperatures (SST) such as the La Niña and El Niño which lead to drought in North America and East China, respectively. Over Africa, the southward shift of the warmest SSTs in the Atlantic and warming in the Indian Ocean is responsible for the recent Sahel droughts. Global aridity has increased substantially since the 1970s due to recent drying over Africa, southern Europe, East and South Asia, and eastern Australia. This drying has been due to the effects of the El Niño-Southern Oscillation (ENSO), Tropical Atlantic SSTs, Asian monsoon and the altered atmospheric circulation due to increased atmospheric moisture demand caused by recent warming (Dai, 2011:45). Climate models predict increased drying over most of Africa, southern Europe and the Middle East, most of the Americas, Australia and Southeast Asia due to climate change (Dai, 2011; Burke et al., 2006; Christensen et al., 2007).

The impact of drought is disproportionate depending on social factors such as demographic characteristics, technology, policy, social behaviour, land use patterns, water use, economic development, diversity of economic base, and cultural composition. The factors that shape vulnerability to drought change over time. Droughts in the same region will have different effects, even if they are identical in intensity, duration, and spatial characteristics (Watts and Bohle, 1993).

In this thesis, the impact of drought on the food system is considered in the context of the existence of other environmental and socioeconomic drivers,

the interactions between these drivers and the feedbacks across the system. The food system framework depicting the various drivers and feedbacks underpinning food security is presented in **Figure 2-2,** and has been applied in analysis of food systems in the context of global environmental change (Ericksen, 2008:239; Ingram, 2011; Drimie et al., 2011).

Figure 2-3 shows that the food systems framework for global environmental change research perceives food system activities and outcomes as influenced by the interaction of global environmental change and socio-economic drivers. Food systems in turn affect both the natural environment and capitals such as social, income, employment, and health through a system of feedbacks.



Source: Ericksen, 2008:239)

Figure 2-3: Food Systems, Drivers, Feedbacks and Outcomes

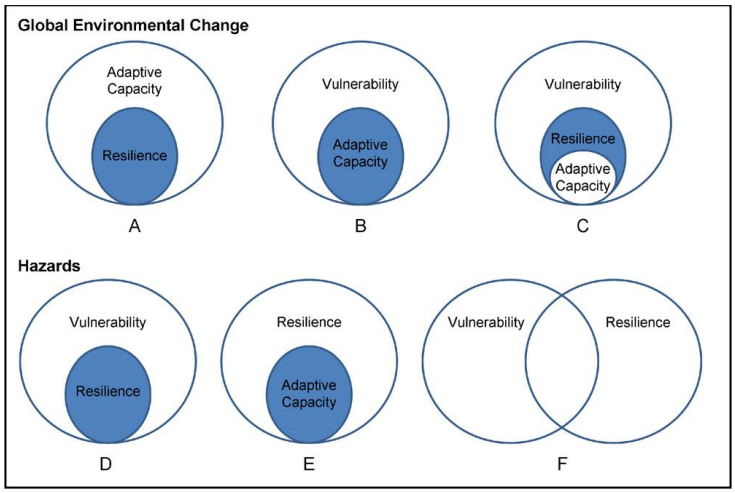
2.4 What determines resilience?

The ability of actors and systems to deal successfully with change, disturbance and surprises is best understood through an analysis of three contested but interrelated conceptions of vulnerability, adaptive capacity and resilience (Miller et al., 2010). By establishing a clear working relationship between these three concepts, it is then conceptually more feasible to develop a practice-oriented framework that enables an understanding of what makes systems resilient, and simultaneously to provide an insight into the factors that create, maintain or transform vulnerability and how pathways out of vulnerability can be created. In enhancing community level adaptation to climate change, the links between vulnerability, adaptive capacity and resilience are vital because adaptation actions that only focus on where immediate benefits to actors can be gained, without systematically addressing the underlying causes of persistent and intractable vulnerability, are unlikely to succeed in the long term (Nelson et al., 2007:397).

2.4.1 The relationship between vulnerability, adaptive capacity and resilience

Vulnerability, adaptive capacity and resilience are dynamic processes that shape responses to adverse conditions. Cutter et al. (2008:600) presented evidence that the relationship between these three concepts is contested across and within the literature on global environmental change and hazards. Within the global environmental change discourse, there are three

schools of thought: the first (a) considers resilience as a component of adaptive capacity; the second (b) focuses on vulnerability and adaptive capacity, and argues that adaptive capacity is an integral component of vulnerability. The third school (c) within Global Environmental Change perceives the three concepts as nested, with adaptive capacity being a component of resilience, while the level of resilience determines the vulnerability of a unit or system (Figure 2-4). Within the hazards paradigm, resilience seen as an outcome is the ability to recover from or cope with disturbance, and is imbedded within vulnerability (d). Other hazards scholars see resilience as a process whereby continual learning and decision making shapes capacity to handle hazards, and tend to view adaptive capacity as embedded within resilience (d). Cutter et al. (2008) viewed the two concepts of vulnerability and resilience as separate but often linked (f). In addition to Cutter et al. (2008), other relationships are equally feasible. According to Carpenter et al. (2001), resilience requires three components i.e. ability to buffer disturbance, the capability to self-organise, and the capacity for learning and adaptation. Using this definition, adaptation is a component of resilient systems, while the ability to buffer disturbance is the vulnerability of a system and is embedded within its adaptive capacity. **Figure 2-4** summarises the three different conceptualisations and their inter-relationships:



Source: Cutter et al., 2008:600

Figure 2-4: Conceptual linkages between vulnerability, resilience and adaptive capacity

It is important that the semantic differences inherent in these three concepts are ironed out if they are to be applied in practice. Miller et al. (2010) argue that there are strong areas of complementarity between these concepts, despite the significant differences. **Vulnerability** refers to the inherent characteristics or qualities of a social system that creates potential for harm. Vulnerability is a function of exposure (who and what is at risk) and sensitivity of a system (degree to which a system can be harmed) (Adger, 2006). Critical to vulnerability is the coping capacity. Coping is shaped by dynamic historical processes, differential entitlements, political economy, and power relations (Eakin and Luers, 2006:370). Assessing vulnerability requires understanding the threat (e.g. climate change) the unit affected (e.g. health outcomes) or the socioeconomic group (e.g. the poor) and the consequences or outcomes of vulnerability (e.g. loss of livelihood) Miller et al., 2010).

Adaptive capacity is ''the ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with the consequences'' (IPCC, 2001). Adaptation does not occur instantaneously and therefore the link between adaptive capacity and vulnerability depends most importantly on the timescales and hazards of concern (Brooks et al., 2005:153).Adaptation or adaptive capacity is different from adjustments, where adjustments are system responses that do not fundamentally alter the system itself, are short term in nature, and involve minor modifications (Kasperson et al., 2005 in Gallopin, 2006:300). Resilience was defined in the first section of this chapter.

On the one hand, vulnerability is loosely interpreted in the resilience literature, where for example, it is viewed as an opposite of vulnerability. Folke (2006:262) and Twigg (2009) present resilience as an opposite to vulnerability, with vulnerability of a social ecological system seen as a consequence of loss of resilience. On the contrary, based on the definitions presented in this chapter, the two need not be viewed as opposite sides of the same coin since they can be understood as measuring different things. On the other hand, narrow interpretations of resilience have led to a focus on assets, social support systems, networks, institutions and learning, disregarding the links between social and ecological resilience as demonstrated by Adger (2000).

Miller et al. (2010) point out that the policy interest in using the resilience concept, as opposed to the vulnerability paradigm, is based on its colloquial

appeal which signals positivity and transformation. Vulnerability on the other hand places emphasis on incapability, negative and potentially stigmatising labels which may influence regressive policies and justifications for interventions that undermine community autonomy or increased marginalisation. The challenge lies with bringing together resilience and vulnerability which have focused on different policy domains and challenges. Miller et al. (2010:7) argue that the two concepts focus on different levels of analysis: vulnerability research focuses on understanding the underlying causes of vulnerability, the scale at which it occurs, and the main actors involved, to identify opportunities for risk reduction, coping and adaptation. The main question investigated is why some people are more vulnerable than others. However, the interactions between longer term and shorter term ecological and biophysical changes are often ignored in vulnerability research, though considerably covered in resilience research. Resilience research, in contrast, focuses on the system-wide interactions.

There is a requirement for an integrated approach that links vulnerability and resilience to underpin sustainable livelihood strategies and more adaptive governance. Such a framework should offer opportunities for reflection on assessing options within changing contexts of social acceptability and experience (Miller et al. 2010:6). In line with the objective of developing a conceptual framework for assessing resilience, this thesis links vulnerability to adaptive capacity through assets and institutions, by adopting some of the key components of the sustainable livelihoods

framework. The basic idea is that vulnerability is shaped by, among other factors, assets and institution, and the same factors influence adaptive capacity. The description of this framework follows.

2.4.2 The Sustainable Livelihoods Framework

The Sustainable Livelihoods Framework (SLF) (**Figure 2-5**) integrates vulnerability and capability (which enable people to deal with shocks, disturbances and institutions) through livelihood assets and institutions. The framework is presented below, and the description follows.

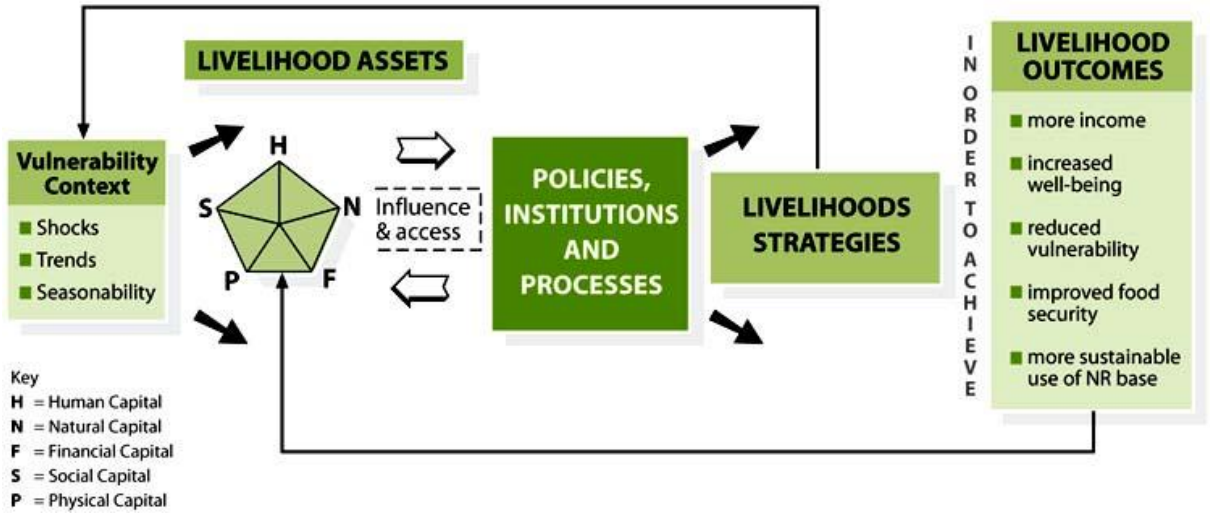


Figure 2-5: Sustainable Livelihoods Framework (DFID, 1999:2)

The SLF is composed of five key components. These are (1) the vulnerability context which describes who is susceptible to what harm and raise the question, why? (2) the assets that people have access to or command over, (3) the policies, institutions and processes that govern how assets are used, and shape the vulnerability context, (4) the livelihood strategies through which food and income are generated, and (5) the outcomes that people

strive for. Livelihoods are described as sustainable if they meet the following three criteria: (1) ability to cope and recover from stresses and shocks; (2) maintain or build on available capabilities and assets; and (3) do not undermine the natural resource base (NZAid, 2007:5). The different components of the sustainable livelihoods framework are described in **Table 2-3**.

Table 2-3: Components of the Sustainable Livelihoods Frameworks

Livelihood Assets	Livelihood assets serve as the basis for people's livelihoods. There are five types of assets that together enable people to pursue sustainable livelihoods. 1. Human-knowledge, skills, ability to labour and good health 2. Social-the resources people can draw upon in pursuit of their relationships of trust and reciprocity 3. Natural-the natural resources available 4. Physical- basic infrastructure and producer goods available 5. Financial-the financial resources people have available
Policies, Institutions and Processes	The institutions, organisations, policies and legislation that shape livelihoods, both positively and negatively. These structures and processes: • Operate at all levels from domestic to international • Operate in all spheres from the most private to the most public • Determine a household's livelihoods strategy, given its livelihood assets
Livelihood Strategies	These are the range and combination of activities and choices that people make/undertake in order to achieve their livelihood goals. Livelihood strategies and reproductive choices, among other things.
Livelihood Outcomes	Livelihood outcomes are the achievements of livelihood strategies. Individuals and households will usually try to achieve multiple outcomes, which may include: • More income • Increased wellbeing • Reduced vulnerability • Improved food security • More sustainable use of natural resources Livelihood outcomes feed back into household assets, with for example, more cash income increasing a household's financial capital
Vulnerability Context	This describes the environment in which people live. People's livelihoods and the wider availability of assets are fundamentally affected by critical trends as well as by shocks and seasonality over which they have limited or no control. Shocks can be the result of human health, natural events, economic uncertainty, conflict and crop/livestock health. Transforming structures and processes influence the vulnerability context. The vulnerability context in turn affects a household's assets.

An asset can be defined as a "stock of financial, human, natural or social resources that can be acquired, developed, improved and transferred across generations. It generates flows of consumption as well as additional stock" (Ford Foundation, 2004:9). Access to assets is seen as central to peoples' ability to escape poverty, while the amount and balance between assets affects livelihoods and determine livelihood options. Institutions, policies and processes determine the transformation of assets to livelihood outcomes such as wellbeing and food security (Christensen and Pozarny, 2008). Conversely, command of assets does not ultimately determine resilience to shocks and stresses, but rather the exercise of power, its dynamics and effects on assets, structures and processes, strategies, outcomes and vulnerability could be more important (NZAid, 2007).

Differential access to assets, (e.g. by gender, age and ethnicity) should be taken into consideration in understanding livelihood and food systems of the vulnerable for the purpose of mapping out pathways for improving their wellbeing. Transfer of assets (e.g. cash, food, farm inputs) for food security and livelihood building characterises and has been important in delivery of most development interventions in the global South (Moser 1998; Ellis 2000). Prowse and Scott (2008) argue that in a similar sense, assets building could be a strategic entry point for climate change adaptation. Microfinance and insurance have been heralded as potentially beneficial as a pathway for asset accumulation targeted at reducing susceptibility to shocks and stresses (Hammill et al., 2008). Patt et al. (2009) have illustrated the importance of

understanding farmers' perceptions of risk, local level communication strategies, and choices based on new or existing knowledge, in making decisions on various assets, as they relate to their livelihoods.

2.4.3 The Link between Livelihood Assets and Resilience

A growing body of literature attempts to connect livelihood assets to coping and adaptive capacity, and more recently, resilience. This sub-section critiques some of the key ideas emerging from literature on asset-based approaches to resilience, highlights some of the indicators of resilience, and signposts areas that require further enquiry. The five asset classes identified in the Sustainable Livelihoods Framework are used. On the basis of relevance to this study, culture and cultural assets have also been included.

2.4.3.1 Financial assets

Access to financial assets, especially liquid assets such as cash savings and credit, has been associated with higher levels of household resilience to drought (Keil et al., 2008). Adger (2002:358) points out that higher income and higher diversity of income favours resilience to stress. Financial assets enable income and food consumption smoothing; provide opportunities for easier and earlier recovery from shocks; and reduce the risk of further loss (Klein et al., 2003; Keil et al., 2008). Financial asset indicators such as employment, value of property, wealth generation and municipal finance

have been used to predict resilience to natural disasters in the USA (Cutter et al., 2008:604). Financial assets are seen as enabling capacity to adapt to changing circumstances, and take risks in a changing climate. However, the observation by Keil et al (2008) in central Sulawesi in Indonesia that some loans are offered at very high interest rates of between 64% and 400% suggests that in some contexts, financial asset such as credit may, to the contrary, increase likelihood of slipping into poverty. Farmers defaulting from loan payments may forfeit their entitlement to land.

2.4.3.2 Physical assets

Physical assets encompass the basic infrastructure (e.g. shelter, water and sanitation supply, energy and communication systems) and producer goods required in order to sustain livelihoods and ensure that people are productive (DFID, 1999:13). Lack of physical assets is associated with poverty and related characteristics such as ill-health, reduced access to education and health facilities, and fewer chances for income generation. Consequently, this may also reduce the productivity of human capital available (DFID, 1999).

The level of physical asset ownership determines the extent to which extremes of weather and climate change impacts pose challenges. Mearns and Norton (2010:235) argue that a high percentage of deaths and injuries, and damage to property due to natural disasters result from insufficient provisioning of infrastructure, including protective infrastructure. The notion by Mearns and Norton (2010: 237) that "the more assets people have,

the less vulnerable they are; the greater the erosion of assets, the greater their insecurity" opens several lines of enquiry in resilience thinking. For example, "does recovery of assets after a shock usefully predict resilience;" "what assets lead to resilience, and how do people decide on which assets to liquidate when faced with stress", and, "are there any contexts within which high access to physical assets actually reduces resilience?"

2.4.3.3 Natural capital

Natural assets encompass the natural resource stocks from which resource flows and services (e.g. nutrient cycling, erosion protection) useful for livelihoods are derived. These encompass intangible public goods (atmosphere and biodiversity) and divisible assets used directly for production in support of livelihoods (trees, land) (DFID, 1999:11). In natural resource-dependent communities, the destruction of natural capital (e.g. forests through fire or floods and earthquakes that destroy agricultural land) may undermine social resilience (DFID, 1999; Adger, 2000). Social resilience is tightly linked to ecological resilience, and this link is negotiated through institutions operating across levels which determine the extent of access to various natural assets (Adger, 2000).

In agro-ecosystems, resilience is produced by the capacity of humans to manage the ecosystem's self-organisational capacity (Cabell and Oelofse, 2012). The Resilience Alliance (2007) notes that more attention should be given to understanding how existing policy frameworks, laws and regulations could be constraining flexibility in natural resource management.

Seed laws may prevent farmers from accessing local seed types, which may have desirable traits under an uncertain climatic regime. According to Di Falco and Chavas (2008), diversity in crop varieties and land use increases resilience to future climate change through promoting both response and functional diversity. Greater genetic variability and greater crop diversity is seen as vital for buffering against shifting rainfall and temperature patterns and possibly reversing downward trends in yields when exposed to shocks. The dependence of local social ecological systems on imported products may promote higher quality of life, but in the long term compromise local resilience (Cabell and Oelefse, 2012). Agricultural diversification increases resilience to crop pests and diseases as well as climate variability (Lin, 2011).

2.4.3.4 Social assets

Social capital is an important social asset that substantially shapes livelihood outcomes. Fukuyama (1999:16) defines social capital as an instantiated set of informal values or norms shared among members of a group that permits them to cooperate with one another. If adequately mobilised, social capital is a resource that permits individuals and groups to meet various goals (Wong, 2003). As Dasgupta (1988) argues, the attainment of such goals is made possible because associated individuals can access more information and coordinate activities for mutual benefit better than those working as individuals. Thus, households with higher social capital have higher incomes (Narayan, 1997). Social capital also enables collective participation in decision making, monitoring of government agencies, lobbying for better

service delivery, and when these fail, may be drawn upon to secure informal insurance from friends, neighbours and the larger community (Cleaver, 2005). Two questions may emerge here: "to what extent can numeric counts of members of social networks effectively predict resilience, and are there any social changes that have altered social capital and hence, resilience?" and "can analysis of social capital be used to understand collective and individual agency, and how does agency relate to resilience." Equally important is the understanding of how trust, social networks and social memory determine capacity of socio-ecological systems to adapt to change (Olick and Robbins, 1998). Social capital based indicators of resilience associated with resilience to natural disasters include size of social network, social embeddedness, and social cohesion; presence of faith-based organisations in the community, and household membership in local associations (Cutter et al., 2008; Keil et al., 2008).

2.4.3.5 Human assets

There are multiple conceptualisations of human capital in social enquiry. From a livelihoods perspective, human capital is defined as representing "the skills, knowledge, ability to labour and good health that together enable people to pursue different livelihood strategies and achieve their livelihood objectives" (DFID, 1999:7). As such, variables including amount of labour available, household size, skills level, leadership potential and health status are important. Keil et al. (2008:297), point to labour capacity, educational

status and technical efficiency as influential in determining agricultural productivity. Differential access to resources and institutions produces uneven human capital and knowledge relevant for coping, and shapes coping capacity as well as persistence in the face of environmental and socioeconomic change (Cutter et al., 2008). The IPCC Fourth Assessment Report identifies human capital as one of the key determinants of climate change adaptive capacity (IPCC, 2007).

Human capital is an essential input in the creation of new knowledge and new products for climate change mitigation and adaptation, with better skilled individuals leading to faster technology development (Griffith et al., 2004; Yohe, 2001). Human capital, largely seen as improved through education and training, improves the capability to adopt technologies. Among other outcomes, education increases the awareness of climate change, thereby increasing the critical mass required to support climate policy (Carraro et al., 2012). There are no empirical studies that have focused on the existence of a relationship between innovation and human capital, and how this relates to resilience in socio-ecological systems.

2.4.3.6 Culture and Cultural Assets

Climate change adaptation literature recognises that adaptation processes are influenced by the value systems, perception of risk, processes and power structures within a society and these are all tightly linked to the culture of a society (Adger et al., 2000:349). This assertion raises questions on the extent

to which lack of understanding on how to integrate culture within adaptation frameworks at policy and programme level could affect resilience at local level, thereby weakening responses to shocks and surprises.

Turner et al. (2008) argue that invisible losses to society, including the undermining of cultural identity and self-determination, are more detrimental than material losses and have a significant effect on the social resilience to global environmental change. Such losses arise from failure of government decision makers to recognise the devastating effects of language suppression, institutional diet and general denigration of local cultures and ways of life. They further argue that the effect of the above losses is manifested through loss of indigenous knowledge or blockade of its intergenerational transmission through language, stories and ceremonies, as well as destruction of traditional economic systems thereby undermining the very elements that enable resilience (Turner et al., 2008:2). Paton et al. (2007:107) argue that culturally determined outcomes that may be associated with resilience are poorly understood in non-western populations. Ungar (2006:219) argues that "we do not yet know what resilience means to non-western populations and marginalised groups such as Aboriginal people who live side-by-side with their 'mainstream' neighbours in western setting".

2.4.4 Institutions, Governance and Policy

Institutional linkages influence adaptive capacity through affecting the flow of resources in relation to social groups (Agrawal, 2008). The analysis of vulnerability of different social groups and the institutional architecture which determines resilience in the context of global environmental change is a major research issue (Adger and Kelly, 1999). According to Tierney and Bruneau (2007), institutional resilience is determined by flexibility in the rules governing organisations, whereby rigidity limits the range of options for adjustment, thus leading to collapse. Leadership style, capacity and level of training, and experience in managing change are therefore, important ingredients for institutional resilience. In addition, the involvement of local communities in disaster management planning and emergency service zoning reduces risk to hazards and promotes resilience particularly in the context of natural hazards (Cutter et al., 2008). However, Agrawal (2008) raises the argument that different social groups have different levels of access to and influence over institutions. As a consequence of being at the periphery of institutions, the poor tend to have less access to resources in comparison to those at the core of decision making and control (Agrawal, 2008). As a result, the poor may not directly benefit from resilient-building measures developed through various institutions.

The level of national government involvement and effectiveness in tackling natural hazards has implications for resilience. In the US, for example, states under-report their level of vulnerability to natural hazards so as to promote

inward investments. The result is to actually undermine their resilience (Cutter et al., 2008). In countries with *good* governance, the legitimacy of the government of the day rests on its capacity to protect its citizens. In such a scenario, resilience to hazards may be expected to be high at the government level. In the case of the oil spills in the Gulf of Mexico, the reaction by President Obama in which he demanded compensation for livelihood loss suffered by fisher-folk and other businesses, demonstrated that effective institutions and good governance mechanisms create a space in which recovery from shocks is more feasible than in those with weak accountability. In the case of weak governance, the expectation is that resilience at the individual and household level is more important than resilience at state level, given that the state offers very limited assistance for recovery. In his speech in response to the oil spill, President Obama mentioned the phrase 'for as long as it takes' to emphasise that compensation would be a long-term issue. This phrase raises questions on the effect of waiting time on capacity for eventual recovery. DFID (2008:3) contends that by empowering vulnerable people as citizens to make legally enforceable claims to entitlements through 'strengthening their voice' helps creates the required pressure to make governments more responsive. Responsive governments are relatively better placed to create an enabling environment for resilience.

Bunce et al. (2010) demonstrated that national and regional level policies that fail to adequately take into account local contexts and dynamics have the

danger of increasing vulnerability and reducing long term resilience levels of local people. Their study focused on four coastal sites in Mozambique, Tanzania and South Africa and highlighted that regional and international policy initiatives in terms of river basin management (Mozambique and South Africa) and development of a Marine Protected Area in Tanzania have actually eroded the resilience of local communities and increased their vulnerability to multiple stressors. In the case of the marine protected area in Tanzania, for example, resilience was seen as having been eroded by loss of fisheries converging with limited alternative livelihoods. Bunce et al. (2010) argue that to promote resilience, policies should take into account cross-scale dynamics of change, interactions between multiple stressors, and long term climate change, and foster adaptive governance mechanisms.

From an agro-ecosystem perspective, increasing globalisation of the food system is seen as threatening local level resilience. Cabelle and Oelefse (2012) assert that regulations, subsidies and global markets have undermined the resilience of organic farming systems, and indeed other farming systems, due to farmers losing ownership of the development process and influence in determination of standards. Some policy instruments such as subsidies, however, are highly beneficial allowing farmers to recover from losses due to market price shocks on the commodity markets.

2.5 Models for assessing resilience

Several approaches and frameworks have been proposed for assessing resilience. Cumming et al. (2005) propose indirect measurement of resilience through the use of surrogates. Their framework equates resilience to capacity of a system to maintain its identity. The main argument here is that by tracking changes in variables in response to a range of drivers and disturbances, and observing any innovations and use of memory (fundamental in determining system resilience) conclusions about the resilience of a system can be made. These conclusions should be linked to likelihood of change or loss of identity.

A similar framework has been applied by Bennett et al. (2005:947) to study resilience in forest ecosystems. They suggest eight very important questions that are applied in steps to identify resilience surrogates. These are:

1. What aspect of the system should be resilient?
2. What kind of change (s) would we like the system to be resilient to?
3. What variables are changing?
4. What processes and drivers are producing these changes?
5. What forces control the processes that are generating change?
6. What are the key elements and how are they connected?
7. What positive and negative feedback loops exist and which variables do they connect?
8. What (if anything) moves the system from being controlled by one feedback to another?

Mathematical models have been applied to measure resilience in savannah ecosystems using the dynamics of good and bad attractors (Martin et al., 2011). Carpenter et al. (2001) suggested that measurement of resilience should be specific. They argued that researchers should be able to specify the system whose resilience is being assessed, clarify the spatial and temporal scales being used, and the stress against which resilience is required. Measurements for biophysical and socioeconomic measures are taken and interpreted.

2.5.1 Indicators of resilience

Cutter et al. (2008) introduced a Disaster Resilience of Place (DROP) model which attempts to link vulnerability of place and resilience thinking. They suggested a range of indicators for assessing resilience at a community level including ecological; social; economic; institutional; infrastructural and community competence. The specific variables measured are presented in **Table 2-4**.

Table 2-4 : Community resilience indicators

Dimension	Candidate variables
Ecological	Wetland acreage and loss
	Erosion rates
	Percentage impervious surface
	Biodiversity
	Number of coastal structures
Social	Demographic (age, race, class, gender, occupation)
	Social networks and social embeddedness
	Community values-cohesion
	Faith based organisations
Economic	Employment
	Value of property
	Wealth generation
	Municipal finance or revenues
Institutional	Participation in hazard reduction programmes
	Hazards mitigation plans
	Emergency services
	Zoning and building standards
	Emergency response plans
	Interoperable communications
	Continuity of operational plans
Infrastructure	Lifelines and critical infrastructure
	Transportation network
	Residential housing stock and age
	Commercial and manufacturing establishments
Community competence	Local understanding of risk
	Counselling services
	Absence of psychopathologies e.g. alcohol, drug, spousal abuse
	Health and wellness
	Quality of life

Source: Cutter et al. 2008:604

Alinovi et al. (2011) developed a household food security resilience index which is based on measures of income and access to food; assets such as land and livestock; social safety nets such as food assistance and social security; access to basic services such as water, healthcare and electricity; households' adaptive capacity which is linked to education and diversity of income sources; and the stability of all these over time. Their study was centred on quantitative analysis of field data. They concluded that further work is required on how to use the resilience index for identifying the key determinants needed to design adequate responses and policies for

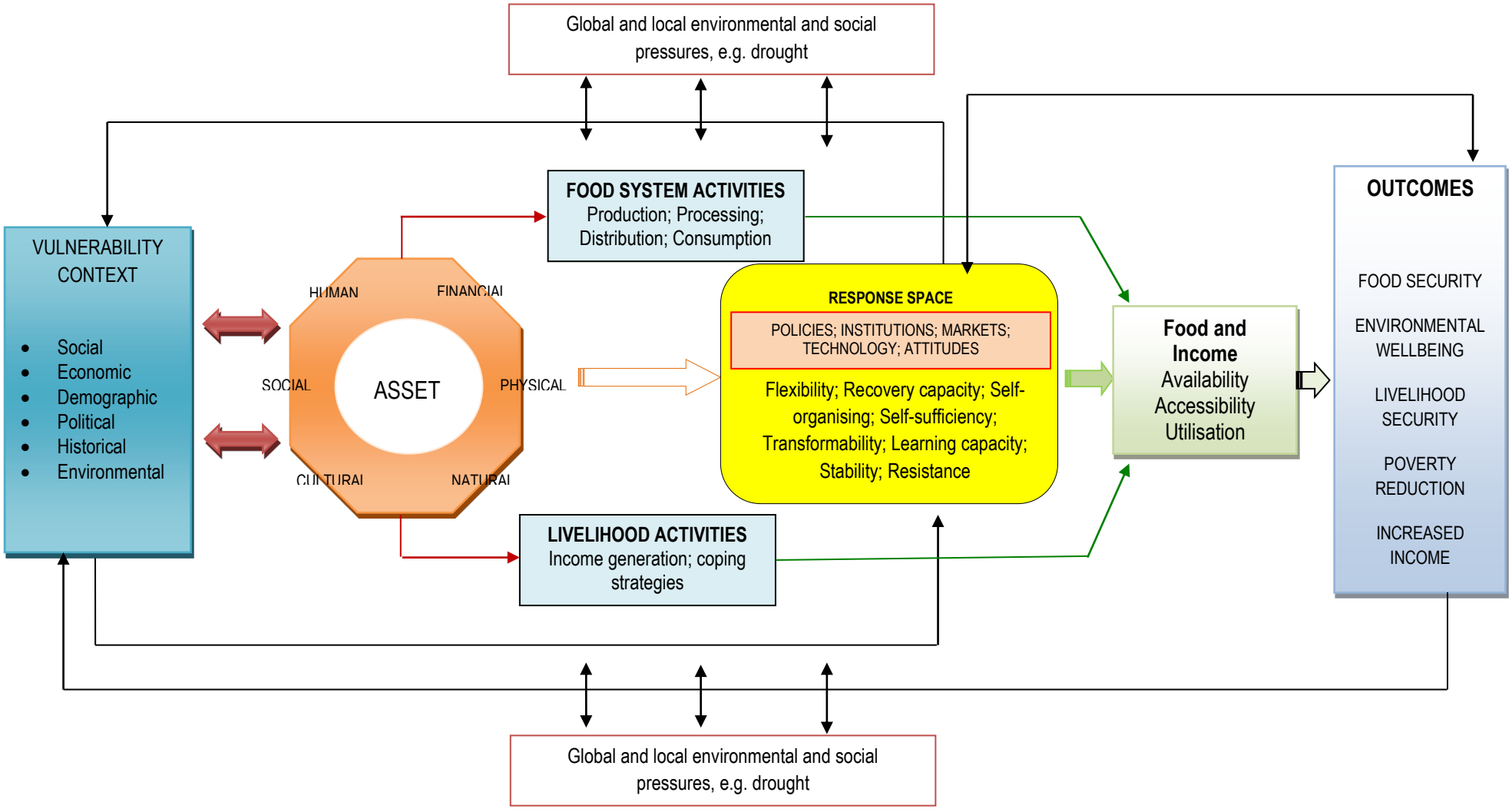
addressing food insecurity, as well as for strengthening household resilience to economic crises (Alinovi et al., 2011:150). The full list of variables is attached as **Annex 1**.

2.5.2 Towards a New Schematic Model

In linking the key ideas emerging from the review of literature in this chapter, a conceptual model for assessing resilience is proposed. The conceptual model presented in **Figure 2-6** links the three concepts (vulnerability, adaptive or response capacity and resilience) which are at the centre of understanding household and community level responses to change and disturbances. The first step is to identify the social, economic, demographic, political, historical and environmental factors that have and continue to drive and reinforce the extent of vulnerability.

Livelihood assets and policies, institutions, markets and other such structures are seen as influential in shaping the vulnerability context, in the face of socioeconomic or environmental disturbances. Concurrently, they have a significant role in determining the range of responses and their effectiveness in ensuring that the primary goal of the food system (i.e. stable delivery of food security) is safeguarded. Livelihood assets are conceptualised as influential in shaping the activities that occur within the food system (from production to consumption) and influencing the livelihood strategies that households and communities can rely on to obtain

income for purchasing food. The livelihood assets that a household has access to or has command over, are in turn determined by existing institutional arrangements, policies, and markets, among others, and shaped by both internal and external changes and disturbances. To understand what shapes resilience within both the food and livelihood systems, which ultimately determine food security stability, the model suggests that the attributes of a resilient system are applied to examine the structural components (policies, markets, norms and values, habits, etc.) in relation to various asset categories, and food and livelihood systems. Thus, the DFID (1999) Sustainable Livelihoods Framework forms an important part of this schema. It is hoped that by asking questions about how the system is performing relative to each of the attributes, the context within which different variables influence resilience may be better understood. Temporal and spatial scales are taken into account in applying this framework.



Source: Author, 2010 (adapted from Sustainable Livelihoods Framework, DFID, 1999)

Figure 2-6: Schematic model for assessing resilience in food systems

On the basis of the research objectives outlined in Chapter One, and in the light of the review of existing literature, **Table 2-5** identifies the research questions associated with each of the study objectives. These questions have been organised around the three main themes emerging in the literature: vulnerability, adaptive capacity and resilience. To fully address these objectives, no less than ten research questions have emerged to address gaps identified in literature review.

The answers to questions 1 to 3 (all of which relate to vulnerability and Objective 1) are presented in Chapter 4. Chapter 5, in tackling the second research objective relating to the role of livelihood assets and institutions, uses empirical material from field research in Malawi to answer two further questions about adaptive capacity. Chapter 6, with its focus on resilience, is grounded through addressing four very specific questions about the characteristics of resilient households, how resilience is perceived, and how policies to reduce vulnerability impact on resilience. Finally in Chapter 7 the thesis' fourth objective is tackled by attempting to conceptualise the empirical findings from Chapter 4 to 6 in order to produce an answer to the more general question of how the relationship between vulnerability, adaptive capacity and resilience should be understood.

Table 2-5: Research objectives, questions and broad issues

VULNERABILITY	ADAPTIVE CAPACITY	RESILIENCE
Research Objectives		
1. Identify and describe the long term and proximate factors that underpin vulnerability to food insecurity in the study areas	2. Evaluate the role of livelihood assets and institutions in shaping coping strategies and adaptive capacity, and analyse the implications for household resilience	3. Determine the characteristics of drought resilient households and assess whether resilience is useful or not as a concept for understanding how smallholder farmers cope with adverse situations such as drought
4. Analyse the utility of the concept of resilience and develop a schematic model illustrating the inter-relationships of resilience, vulnerability and adaptive capacity.		
Research Questions		
1. Using indicators of vulnerability identified in the literature review, what is the extent of vulnerability to food insecurity in the study areas? 2. What are the main and salient factors that drive and maintain vulnerability to drought-induced food insecurity? 3. What is the process through which vulnerability to food insecurity is produced?	4. Which livelihood assets are critical in influencing household adaptive capacity to drought and other stressors? 5. Under what conditions or context does access to different assets contribute to, or diminish adaptive capacity?	6. What are the socio-economic characteristics of resilient households? 7. How is resilience perceived or understood across different social groups? 8. To what extent are measures aimed at reducing vulnerability contributing to resilience?
9. How should the relationship between vulnerability, adaptive capacity and resilience be understood in the context of developing measures to promote resilience?		

Chapter 3

Research Methodology

3.1 Introduction

This chapter provides a description of the study area; methods used for data collection and analysis, and the limitations of the study. To guide the interpretation of the findings, positionality issues and ethical considerations taken into account by the author are also discussed.

3.2 The Study Area

Malawi as a case study country in southern Africa was selected on the basis that it most demonstrated the following: (1) physical and social vulnerability to climate change (2) experience of drought induced food insecurity (3) availability of different social systems and agro-ecological regions with an influence on resource access, adaptation decision making and agricultural productivity, and (4) relevance of the research to national level policies and the case study's representative-ness of the prevailing regional scenarios.

1) *Physical and social vulnerability to climate change*

Malawi's climate is subtropical in nature and is characterised by strong seasonality and relative dryness. Extremes in climate variability have led to a series of droughts and dry spells being experienced in the recent past. Future climate change scenarios for Malawi while highly uncertain are generally

inclined towards warmer, drier and shorter agricultural seasons (MMS, 2006; McSweeny et al., 2008; IPCC, 2007; GOM, 2002). Although an average rainfall of 850mm is generally sufficient for agricultural production, there are concerns about the increased variability within seasons and volatility of rainfall resulting in dry spells, droughts or floods and subsequent food productivity shortfalls, food shortage, malnutrition and hunger (Phiri and Saka, 2009; GOM, 2006).

With 85% of the national population dependent on agriculture, mainly rain-fed in smallholder farming systems, and the national economy receiving 32% of its income and 80% of foreign exchange from agriculture, climate change presents profound challenges to the success of the agro-based economy and has implications for food security and livelihoods for the majority of the population. Exacerbating the vulnerability to climate change impacts is the high poverty levels estimated at 68% in 2005 (World Bank, 2010) and low level of human development (Malawi has a human development index (HDI) of 0.400 and is ranked 171 out of 187 countries surveyed) by the UNDP (2011).

2) *Experience of drought and food insecurity*

The Draft National Disaster Management Plan identifies droughts, floods, seismic activities and pests as hazards of importance to Malawi. Malawi experiences drought once in every three to five years. In the non-pronounced drought years, intermittent long dry spells within the rainfall season are common experiences (GOM, 2009).Within the last decade the frequency,

intensity and magnitude of drought and dry spells has significantly increased (MMS, 2006).

Historically, the 1948-49 and 1991-92 droughts are the worst drought experiences in the last 60 years. According to the National Disaster Profile, other droughts that have had country-wide impacts include those in 1996/97, 2002/03 and 2005/06. The 2005/06 drought resulted in food productivity falling 37% below national requirement. While the NAPA (GOM, 2006) identifies the whole country as vulnerable to drought, Chikwahwa and Nsanje districts in the Southern Region are more frequently affected by droughts and dry spells, and therefore more prone to food insecurity. Annually, Malawi loses 1.7% of its GDP (about US$22 million in 2005 prices) to droughts and floods (Pauw et al., 2010). **Table 3-1** shows that drought was the most important natural disaster in Malawi for the period 1980 to 2010.

Table 3-1: Top Ten Natural Disasters in Malawi 1980-2010

Disaster	Date	Total Population Affected
Drought	Apr-92	7,000,000
Drought	Oct-05	5,100,000
Drought	Feb-02	2,829,435
Drought	Feb-90	2,800,000
Drought	Jun-05	1,429,267
Drought	Oct-07	520,000
Flood	Jan-01	500,000
Flood	Feb-97	400,000
Flood	Dec-02	246,340
Flood	Nov-07	180,246

Source: "EM-DAT: The OFDA/CRED International Disaster Database, Created on: Aug-1-2012.

3) Agro-ecological zones and social differences

The current study postulates that agro-ecological environments have some influence on the potential livelihood and agricultural diversity for farm households. Malawi has eight ecological zones differentiated by rainfall, temperature, and vegetation and biodiversity status. Rainfall varies from 725mm to 2500mm annually. The highlands are cooler and wetter while the low-lying areas tend to be hotter and more humid. Temperature ranges from 14 to 24°C between November and April, and 19 to 32°C between May and October (EAD, 2004; MMS, 2006).

Societal differences in Malawi may be understood through the different marriage systems which have an influence on access and command over productive assets, including those of primary relevance to agriculture, such as land, livestock and labour. In patrilineal societies access to land is negotiated through the husband's lineage and the male is also the family head. On the contrary, within matrilineal societies land is accessed via the woman's family, unless the woman is taken to live in the man's village. The woman's brother assumes the role of family head (CEDAW, 2008). In both matrilineal and patrilineal societies, the male partner is regarded as the key controller in the use of any land allocated to his family. CEDAW (2008 The Northern region is predominantly patriarchal while the Central Region and parts of the Southern Region are matrilineal. The present study hypothesised that differences in culture have a bearing on the nature and extent of

vulnerability to climate change and influence the capacity to respond to shocks and surprises.

4) Policy relevance

The Government of Malawi ratified the United Nations Framework Convention on Climate Change in 1992. Droughts and floods are recognised as the main threats caused by climate change in Malawi (GOM, 2006). The country's climate change adaptation strategy is outlined in the National Adaptation Programme of Action (NAPA) which sets out fifteen national priorities for adaptation. Two of the top five most urgent priorities considered by this study are: (1) Improving community resilience to climate change through the development of sustainable rural livelihoods, and (2) Improving agricultural production under erratic rains and changing climatic conditions (GOM, 2009). Lack of evidence to influence action and limited understanding of vulnerability and resilience are cited as constraints to adaptation strategy implementation (GOM, 2009).

The Government of Malawi has demonstrated strong commitment to achieving food self-sufficiency at a national level. The Farm Input Subsidy Program was introduced in 2006 to improve smallholder farmers' access to improved seed and fertiliser for the purpose of raising food security and incomes. Despite attainment of surplus in the years following the introduction of the subsidy program, localised food insecurity hotspots have

persisted in areas such as Nsanje and Chikwawa, as indicated in various Famine Early Warning Systems Network (FEWSNET) reports.

3.2.1 Sampling of Districts

Two of the 28 districts in Malawi, Nsanje (61metres above sea level) in the Southern Region and Mzimba (1954m above sea level) in the Northern Region, were selected on the basis of contrasting environmental, socio-economic and cultural features. According to the Department for Meteorological Services data, both districts have near similar long-term average rainfall. For the period 1998 to 2007, the average annual rainfall for Nsanje as recorded at Ngabu Station was 872mm while Mzimba Aerodrome recorded 865mm for the same time period. Average temperatures, which are important in driving evapotranspiration and also determine effective rainfall, were reported as being much higher in Nsanje (maximum 32.3°C; minimum 20.7°C) than in Mzimba (maximum 26.4°C; minimum 15.3°C). Despite the similarities in average rainfall amount, Nsanje has suffered from more frequent droughts, dry spells and floods than Mzimba, given the relatively higher climate volatility of the former (MMS, 2008).

In addition to Nsanje's climatic volatility, the combination of factors including low soil fertility, land degradation due to high population pressure (123people/km^2) and limited access to agricultural land (72% of households have less than 1 hectare of land) has led to Nsanje suffering more

frequent food production shortfalls which increase the risk of food insecurity. Flooding in Nsanje is due to the geographical location of Nsanje proximal to the mouth of the major rivers in the Lower Shire valley, notably the Shire Mwanza and Ruo which are all heavily silted (GOM, 2009).

In contrast, Mzimba enjoys more evenly distributed rainfall, and the cooler temperatures all year round promote more effectiveness of rainfall. Soils are generally more deep and fertile, predominantly sandy clays and loamy in comparison with the lighter sandy loams and loamy sands with lower moisture and nutrient retention capacity. FEWSNET reports show that Mzimba is generally food secure in average years, while Nsanje is a food insecurity hotspot, facing food insecurity even in years when the national food balance is positive. The droughts in 2001 and 2005 upset the food security status leading to depressing outcomes as experienced elsewhere in the country. The experience of food crises in Mzimba has been blamed on the failure to diversify the agricultural base beyond tobacco, cassava and maize. In contrast, farmers in Nsanje depend on maize, sorghum, millet, rice and sweet potatoes. Cotton is the major cash crop in Nsanje (GOM, 2009; Food Security and Nutrition Survey, 2008).

Socially, Nsanje district has both patrilineal and matrilineal marriage systems which determine the lineage asset command structure. Mzimba is predominantly patriarchal and 'payment' of bride price is still widely practiced. The differences in social systems allows for examination of gender dynamics in both resource access and decision making in socio-agro-

ecosystems. The demographic and health indicators for the two districts are summarised in **Table 3-2**.

Table 3-2: Key demographic indicators for Nsanje and Mzimba, 2008

Indicator	Malawi	Nsanje	Mzimba
Population	13 077 160	238 103	727 931
Number of households	28 929 13	51 685	139 466
Population density	139people/km^2	123people/km^2	70people/km^2
Total fertility rate	6.8	6.0	5.7
U5 infant mortality rate	140/1000	151/1000	124/1000
Literacy rate	64%	52%	75%
Net migration %	0	-13.2%	-2.1%
HIV prevalence (regional mean)	12%	20.5%	10.2%

Source: NSO, 2009

3.2.2 Sampling of EPAs, Villages and Households

Multi-stage sampling was conducted to identify a representative population from which inferences relevant to the wider population could be made.

3.2.2.1 Extension Planning Areas and Villages

Consultation with local experts and review of secondary agricultural performance and food security data were used to sample two Extension Planning Areas (EPAs) for each one of the studied districts. The study sampled an EPA with a history of high food security and generally good response to droughts, and another which had demonstrated high susceptibility to droughts and proneness to food insecurity. food security and For each of the two districts sampled, two Extension Planning Areas

(EPAs), one with a history of relatively high food security and good response to droughts and the other, prone to food insecurity and highly susceptible to droughts, were identified based on secondary food security data and interviews with local experts. In Nsanje, Nyachilenda EPA was identified as more susceptible to droughts while Makhanga was selected on the basis of its relatively good long term food situation. In Mzimba, Manyamula EPA was the food insecure site while Vibangalala EPA was considered the more food secure counterpart. Within each EPA two villages were purposively sampled thereby resulting in a total of eight villages for the two districts.

The sampling strategy used was adapted to suit the requirements of the study while also taking into account the prevailing field realities (Gibbs, 2007: xi). Like in the case of selection of EPAs, villages of contrasting food security experiences were selected. Food secure and chronically food insecure villages were sampled in order to capture diverse factors that were promoting or undermining resilience. In addition, the presence or absence of an NGO or governmental intervention was also considered, since the role played by NGOs and government was of importance to the study. In the subsequent stratification type of marriage system was applied to capture the gender dimensions of vulnerability, adaptive capacity and resilience. In Nsanje two marriage systems exist (patrilineal and matrilineal) while Mzimba is dominated 100% by patrilineal marriage system. On these criteria, two patrilineal and two matrilineal villages were selected in Nsanje.

On the basis of the food security criteria discussed, **Fig. 3**-1 shows the districts, EPAs and villages selected for the study. The yellow coloration has been used to indicate a generally higher susceptibility of the location to food insecurity, while the EPAs and villages represented in green have generally exhibited relatively higher levels of food security. In the case of Nsanje, the villages Mbazo and Nyachikadzi had higher proportions of matrilineal households, compared to Chibuli and Khasu. All the villages in Mzimba were predominantly patrilineal.

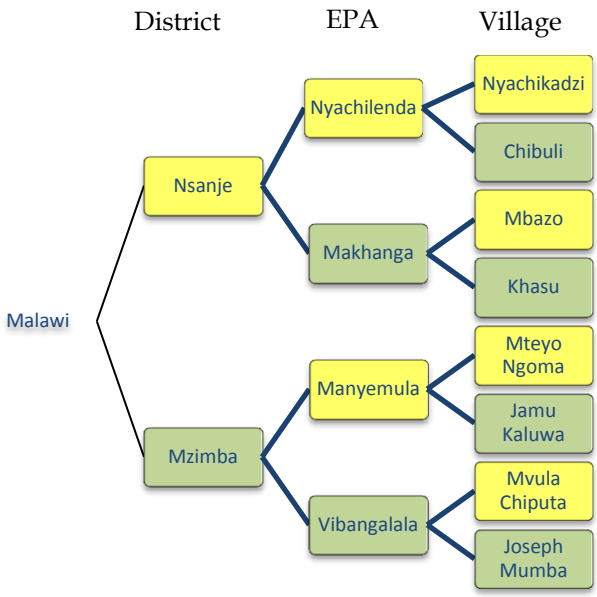


Figure 3-1: Extension Planning Areas and Villages Sampled for the Study

The geographical location of the districts and EPAs where sampled villages are found within Malawi are shown on the map in **Figure 3-2.**

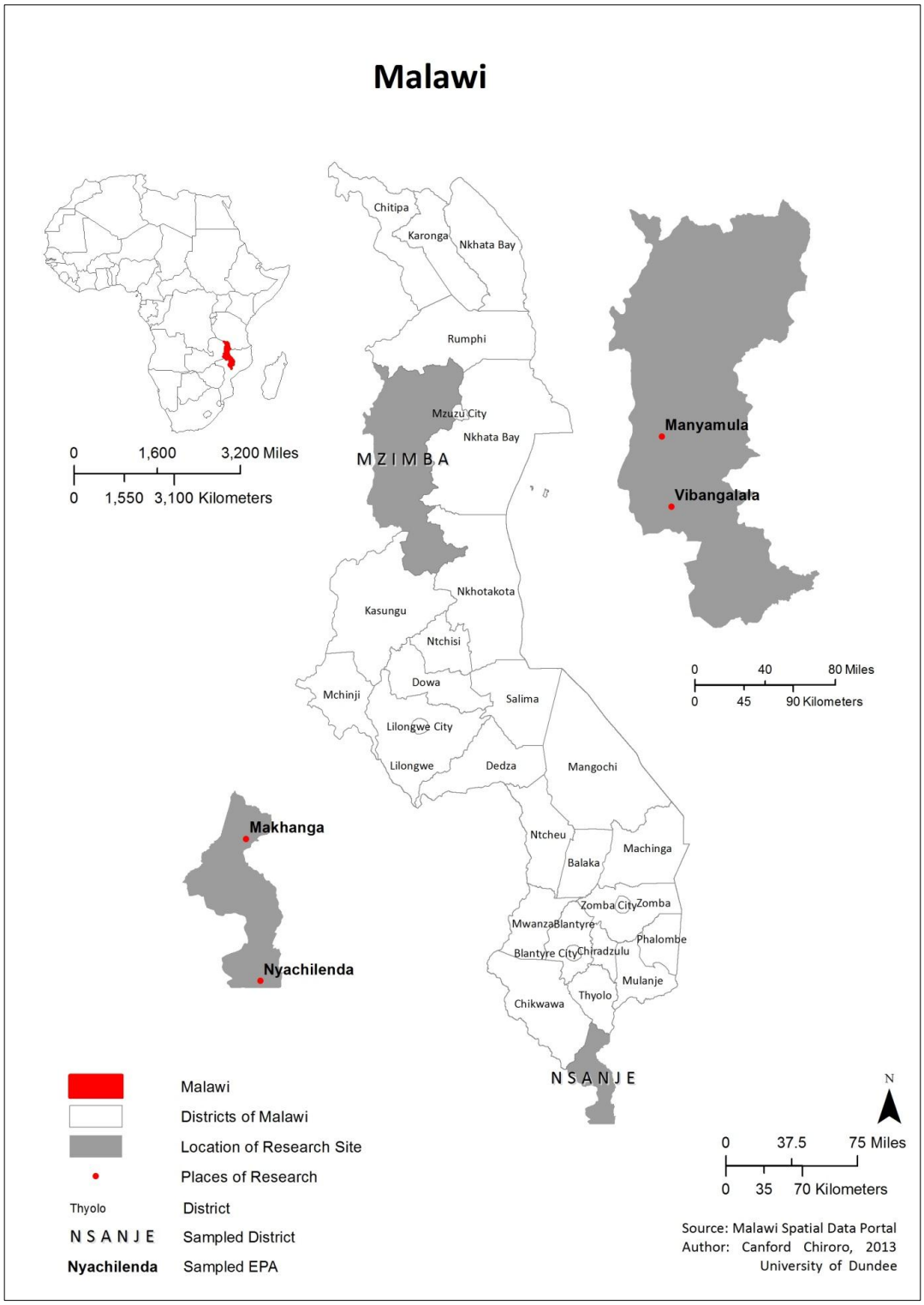
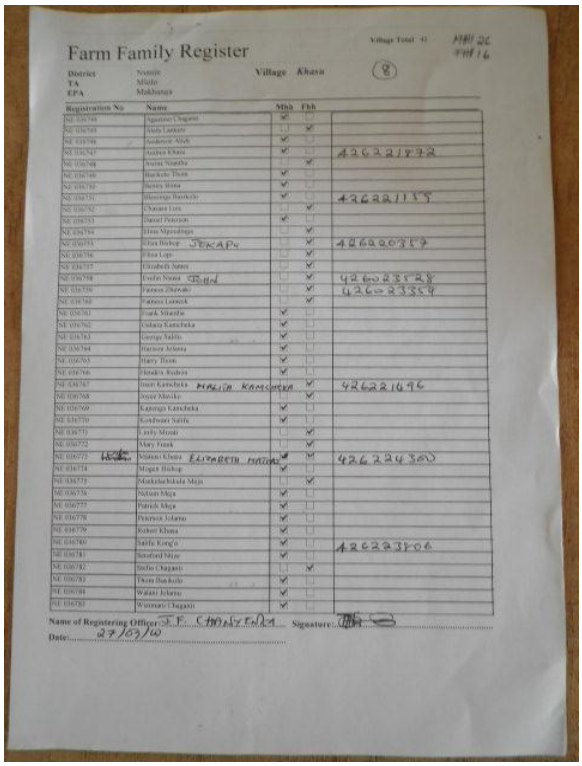


Figure 3-2: Map shows location of the study areas in Malawi

3.2.2.2 Household Level

Within villages, gender representativeness was the main variable for stratifying the sample population. Literature on food security in Malawi emphasised the effect of gender of the head of household as very important in determining income and food productivity outcomes through influencing access and command of key resources such as land, labour and other livelihood assets.

The Village Farm Family Register, as shown in **Figure 3-3** lists all the households within a village and indicates the gender of the head of household.



Source: Author, 2010

Figure 3-3: Farm family register in Nsanje

Respondents for the study were drawn randomly from each gender. The process of drawing up respondents was done at a community level meeting where the researcher was introduced and the purpose of the study outlined. The random nature of participant section was applauded by community members as fair, relative to the specific targeting sometimes on unclear criteria done by food aid programmes. Interest groups like the elderly and child-headed households were interviewed by way of in-depth interviews.

3.2.3 Unit of Analysis

Different aspects of vulnerability, adaptive capacity and resilience are manifested and can be understood at different scales ranging from the individual, household, community, national up to the regional level. The current study uses the household level and its interaction with the community as the unit of analysis on the basis that the household is the most immediate structure for decision-making since various assets that define the household's wellbeing are owned or commanded at this level.

Importantly, within the African context, the tight social and economic coupling of the household and extended family (Anderson, 2011) through remittance flows, transfers and exchanges to enable income and food consumption smoothing, care and psychosocial support, labour and material resources flows, among others, cannot be ignored as they all critically contribute to the determination of vulnerability and resilience. In addition, it

is also clear that interventions through development and humanitarian aid and disaster risk reduction are targeted at household and community levels and therefore their impact with respect to shaping resilience is best assessed at that scale.

3.3 Data Collection Methods

The research adopted a multiple methods approach to social inquiry. The multiple methods approach is defined by Philip (1998:265) as being "the situation in which a number of complimentary methods are employed to address different facets of a research question or to address the same question from different perspectives". Philip (1998) further argues that the multiple methods approach is poly-vocal and thus "privileges multiple ways of looking at the social world" and "facilitating the exploration of different truths" (Graham, 1995 in Philip, 1998:262).

Consistent with Bryman (1992) and Creswell (1994), using more than a single method for generation of evidence provides a basis for triangulation and validation thereby minimizing error associated with research process subjectivity. McLafferty (1995:440) asserts that the mixture of qualitative and quantitative elements within research design has the benefit of "illuminating people's lives and the larger contexts in which they are embedded" which is achieved through "coupling the power of the general with the insight and nuance of the particular". Household questionnaires, focus group

discussions, and key informant interviews were used to collect primary data. The methods and description of implementation in the field are described in the sub-sections that follow.

3.3.1 Household Questionnaire

3.3.1.1 Design

The household questionnaire was designed based on the need to effectively respond to the research questions identified. Variables of interest that could be understood at the scale of the household were therefore formulated into questions. The resulting draft questionnaire was translated into local languages, piloted and subsequently revised accordingly. In translating, specific attention was paid to the need to ensure that the language was kept simple and non-technical and therefore easily understandable by all respondents, and that the meaning of questions was consistent to enable comparison of responses (Payne and Payne, 2004). Leading, potentially embarrassing and irrelevant questions were progressively removed following translation, pilot testing and discussions with local researchers.

The questionnaire was organised into six sections: demographic characteristics; livelihood activities and assets; agricultural production and productivity; food security; experience of drought; seasonal climate forecasts and existing measures for disaster risk reduction. Each questionnaire-based interview was lasting between 30 and 45 minutes in duration. A copy of the questionnaire is attached as **Annex 2**.

3.3.1.2 Implementation

Household questionnaire-based interviews were conducted concurrently with focus group discussions to minimise the influence of insights from focus group discussions on responses to questionnaires, as well as ensuring that individuals were not interviewed more than once.

A total of 200 of the 207 households approached took part in interviews lasting between thirty and forty five minutes. The total of 200 was achieved by replacing the households where respondents were not available for interview due to 'unforeseen' eventualities. This represents a 96.6% response rate.

This high response rate was influenced by three factors: (1) the village heads often requested community members to offer their support to the research process, and because they wield a significant level of power, community members seldom do otherwise in fear of reprisal. Participants were made aware that their participation in the survey was voluntary; (2) there was a subtle expectation that participation could lead to potential benefit from the study. Although the author clarified this issue, the influence cannot be totally eliminated; (3) Interview times were agreed at least a day in advance. Any extenuating circumstance, such as rain on the night before the interview, which often meant the next day inadvertently became a working day for the research participants, were countered by adjustments made to starting times by the author.

After reviewing the quality of completed questionnaires, 195 of the 200 completed interviews were suitable for use in quantitative analysis. Within the sampled households, respondents had to be a member of the household who was present in the last farming season. **Figure 3-4** shows a male research assistant interviewing a female respondent in Nsanje district.

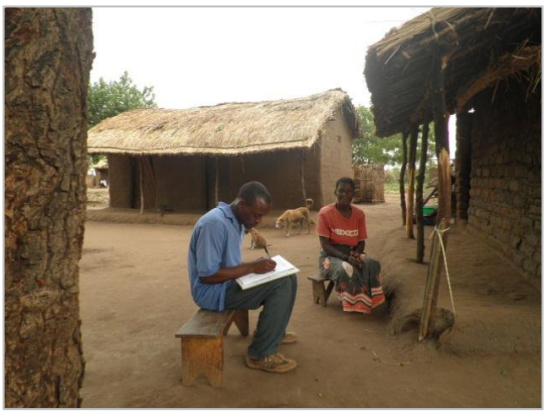


Figure 3-4: A household questionnaire-based interview being conducted with a woman in Khasu Village in Nsanje

Tables 3-3 and **3-4** depict the representativeness of the study sample. In terms of representation by gender 47.7% of the study respondents were female.

Table 3-3: Distribution of questionnaire respondents by gender

Gender of respondent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	93	47.7	47.7	47.7
	Male	102	52.3	52.3	100.0
	Total	195	100.0	100.0	

Source: Author, 2011

Table 3-4 compares the study respondents' age distribution to the national population distribution based on the 2008 census. It is shown that the study population under-represented individuals below the age of 18 years, and over-represented the older age cohorts, particularly those aged 36 years and above. The study sample comprised of 32.5% of respondents aged between 36 and 55 years, and 35.9% aged 56 years and above, compared to proportions of 12.8% and 7.2%, respectively, as reflected in the 2008 census (NSO, 2009). Older respondents were selected by both default and purpose. The current study sought to interview heads of households, of which only 3 out of 195 respondents were below the age of 18 years. Since the research questions sought to explore the long term perspective of the processes that had shaped both vulnerability and adaptive capacity, older respondents were identified as more likely to be more articulate relative to younger respondents.

Table 3-4: Distribution of respondents by age

Age of respondent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 18 years	3	1.5	1.5	1.5
	19-35 years	58	29.7	29.9	31.4
	36-55 years	63	32.3	32.5	63.9
	56 years+	70	35.9	36.1	100.0
	Total	194	99.5	100.0	
Missing	System	1	.5		
Total		195	100.0		

Source: Author, 2011

On completion of data collection, a code book was developed. The code book specified codes for all variables captured by the questionnaire, including non-responses and new codes based on 'If other…please specify' responses.

3.3.2 Focus Group Discussions

3.3.2.1 Design

The focus group discussions (FGD) were designed to complement the quantitative outputs from the household questionnaire, thus providing insight into causality and moving beyond sheer associations of variables (Miles and Huberman, 1994:147). FGDs are discussions organized to explore a specific set of issues through explicit use of group interaction (Kitzinger, 1994:104). These discussions are useful in highlighting the attitudes, priorities, language and framework of understanding by the respondents (Kitzinger, 1994). Through use of this instrument, Kitzinger argues, the researcher is able to encourage a "great variety of communication", as well as to identify group norms and values, explore social processes in the articulation of knowledge, and encourage conversation on issues that may not be effectively discussed at individual level.

The choice of focus group interviews hinged on the need to facilitate further elaboration on specific and broader issues covered through other instruments, particularly the household questionnaire. As pointed out by Morgan (1988:12), this would allow the researcher to "produce data and insights that would be less accessible without the interaction found in a group". The design and facilitation of the FGD sought to provoke discussion and stimulate people into making explicit their views, perceptions, motives and reasons (Punch, 2005:171).

Thus, the focus group interviews did not only record the responses from the participants, but also provided an opportunity for the researcher to explore the social dynamism of the community and to observe the non-verbal responses to questions or comments raised in the discussion. It also provided a way of analysing the similarities and differences between the participants and the nature of their arguments. Through such exploration of the group itself and the nature of the responses, the researcher was able to understand some issues which needed further investigation through other instruments. The focus group discussion guide is attached as **Annex 3** of this thesis.

3.3.2.2 Implementation

At least two focus group discussions were conducted for each of the eight villages included in the sampling frame. In total 16 focus groups involving 203 participants were conducted in the eight villages. In all villages, except for Mbadzo where it was difficult to control the choice of participants, participants were purposively selected to represent the different socio-economic groups (poor to rich) and livelihood sources (e.g. farmers, fishermen). The participants were drawn to get as much a representative picture of the village as possible. The two focus group discussions were gender segregated on the advice of local experts who argued that such was the local cultural preference, and that other researchers had concluded that women tended to be less active in discussions in the presence of men and as such, issues pertinent to women were often given less attention or misrepresented. Within these groups were different age categories (younger

and older participants), marital status (including single mothers, divorcees, etc.) and marriage type (patriarchal, matrilineal). Community members who were part of such committees as the Civil Protection and the Village Development Committee were interviewed in separate focus groups or through key informant interviews.

The survey had a target of between six and twelve participants per focus group discussion. Based on experience from field practice (e.g. Good Enough Guide, Oxfam 2007), this size of group is large enough to generate a lively discussion where all members can have the space to air their views, but compact enough to enable ease of management and contain the discussion. In practice, selecting that number was a political challenge given that participation in all community meetings is for all and as such the research process had to be explained to the whole community before starting. **Figure 3-5** shows a men's focus group in Mteyo Ngoma Village in Manyamula, Mzimba. **Table 3-5** shows the number of people who participated in the focus groups conducted in Nsanje and Mzimba:

Table 3-5: Number of participants in focus group discussions in Nsanje and Mzimba

District	EPA	Village	Males	Females	Total
Nsanje	Makhanga	Khasu	8	11	19
		Mbadzo	26	31	57
	Nyachilenda	Nyachikadzi	6	10	16
		Chibuli	7	12	19
Mzimba	Vibangalala	Mvula Chiputa	12	16	28
		Joseph Mumba	8	9	17
	Manyamula	Jamu Kaluwa	9	13	22
		Mteyo Ngoma	18	7	25
TOTAL			94	109	203

Source: Author, 2011

Each focus group discussion lasted between one hour and one and a half hours and was guided by a focus group discussion guide, a set of thematic and specific questions on issues under investigation. Despite these guiding questions, the approach taken was more flexible allowing the participants to identify issues that were of importance to them in such a way that richer dialogue and deeper thinking was encouraged as participants reflected on their actions and experiences.

Figure 3-5: A focus group discussion with men only in Mteyo Ngoma Village in Mzimba

3.3.3 Key informant interviews

3.3.3.1 Design

Key informant interviews are semi-structured interviews with individuals considered as capable of providing an expert and useful insight about other people, processes or events being researched. At the inception of fieldwork, a key informant mapping exercise was done to identify the institutions and individuals from whom data and information to answer the research

questions would be collected. The key informants were organised into sectors (agriculture, food security, disaster management, natural resources, etc.) across institutional scales (village, EPA, district, national). Research questions were then focused by level and field to ensure that relevant questions were directed to respondents with the relevant experience on the subject. **Table 3-6** identifies the organisations and institutions from which key informants were drawn. The total number of individuals met is indicated in each case.

Table 3-6: Key informant sources

Level	Key Informant Sources
Village	Village Civil Protection Committee member (8) ; Agriculture extension officer (10); Village Head (8); Village Development Committee member (5); Lead farmer (2), the elderly (5), traditional healer (1)
EPA	Head of Agriculture Extension Department (AEDEC) (4); Traders (4)
District	District Planning Officer (2); District Administrator's office (1) ; Department for Disaster Management Affairs (1); Ministry of Agriculture and Food Security District Office, DADO (2) ; NGOs and civil society groups (10)
National	Department of Meteorological Services and Climate Change (2)
International	International Agricultural Research (2)

Source: Author, 2010

3.3.3.2 Implementation

Some initial key informant interviews were conducted prior to household questionnaire based interviews and focus groups in order to obtain the expert view from individuals sampled from **Table 3-6**. While this helped in terms of focusing issues (e.g. for Nsanje it became apparent that floods were more important drivers of food insecurity than drought, and had to be given more attention), the expert opinions were used to form an alternative

perspective against which communities could reflect. This allowed for probing of responses and triangulation of data.

A total of 64 formal and informal interviews (of which 46 were formal) were conducted with key informants in the study areas. The formal interviews were recorded with permission, translated, transcribed and coded by themes for analysis. On average, interviews normally lasted between 30 minutes and an hour. The key informants also served the purpose of providing secondary data or directing the researcher to other sources. Another advantageous position was that the researcher stayed in some of the guesthouses that were frequented by local leaders (especially government and NGO staff) and had the opportunity of informally discussing some of the issues relevant to the study in a more relaxed atmosphere. The key informant guide is attached as **Annex 4.** Key informants also provided secondary data (e.g. census reports, vulnerability assessment reports, baseline study reports, disaster management plans, district-level socio-economic analysis report etc.) that was used for planning and context analysis purposes.

3.3.4 Transect Walks

3.3.4.1 Design

A transect walk is an ethnographic approach to research that involves walking through a research site with a willing resident (Taplin, 2002:87). The current research used these walks as a means for both validating some of the

claims made by the research participants and observing the research landscape in order to obtain an understanding of the practices, processes and physical conditions that were shaping the issues under study.

3.3.4.2 Implementation

The transect walks conducted in the current study were informal in nature and often without the use of the voice recorder so as to help put the participants at ease thereby allowing for more effective engagement with the research process. The transect walks included visits to farmers' homesteads, fields and other local places of interest such as irrigation schemes and markets. During the course of these walks, participants described the social and physical landscape, and questions were asked on a range of issues pertinent to the study. For example, the land tillage practices, siltation of rivers, overharvesting of firewood in the forest, informal markets for fertiliser and seed, and postharvest processing of grain were discussed. Photographs were taken to capture some of the examples of the cases observed, and these have been used in the following results chapters. Participants for this component of the study were drawn from across the village socio-economic profile and included vulnerable groups, young farmers, village leaders, members of irrigation schemes or community disaster management committees, extension officers and other local experts.

3.3.5 Timing of the field study

The research survey was conducted over a four-month period from mid-October 2010 to mid- February in 2011. This period coincided with the lean season (characterised by poor food consumption patterns) and the onset of the 2010/2011 agricultural season. This timing allowed for a real-time evaluation of activities and processes (e.g. land preparation, input procurement, seeding and planting, employment of a range of food insecurity coping mechanisms and seasonal planning). During this period there were incidents of flash flooding in parts of Nsanje to which the government issued evacuation warnings to communities. In Mzimba, farmers were concerned about the slump in tobacco prices and the effect of on-going negotiations on the future of burley tobacco at the World Trade Organisation.

3.4 Analysis of data

3.4.1 Qualitative Analysis

Qualitative field notes from discussions and interviews were processed and organised by thematic area to produce a report at the end of each field day. The main concern for the researcher was to process and analyse these notes while the context in which they were captured was still fresh in memory. These field reports formed the basis of on-the-field data analysis which was important in generating and identifying new questions, further inquiries or clarification on specific issues.

Focus group discussions and key informant interviews were transcribed at the end of the field work. However, key issues emerging and insights emerging from the data collection process were analysed as the data collection progressed and even before the full transcripts had been produced. The descriptors of respondents were all recorded along with the transcript as a means of enabling analysis of associations between these descriptive variables and the responses.

The instruments for qualitative data collection had been designed along thematic areas as encapsulated in the conceptual framework. By organising questions around themes and sub-themes, responses from various respondents, including key informants, on a particular theme or sub theme could then be compared for similarity, difference, consistency thus enabling analysis of multiple perspectives and triangulation of findings. Through analysis of content, the analysis sought to identify emerging perspectives and discourses. Other forms of qualitative data, such as photographs, were labelled, organised by source and used along with text to illustrate specific issues.

3.4.2 Quantitative Analysis

The Statistical Package for Social Sciences (SPSS) was used for the analysis of quantitative data based on the household questionnaires. Initially the SPSS data entry sheet was revised (based on the version created after pilot test) to include new categories following post-coding of questionnaires and as

guided by the code book. The 195 questionnaires were then entered, with a sample of randomly selected questionnaires being double-entered to check for level of data entry accuracy. Following this, the data was cleaned for errors through use of validation rules and identification of unusual or duplicate entries using SPSS.

Variables relevant to the research questions were organised into either outcome or predictor variables. New variables and dummy variables were also created to facilitate analysis of different types of data. The main aim, consistent with the research objectives, was to identify the factors that had more or less influence in shaping specific outcomes that were interpreted as consistent with resilient systems.

SPSS was used to generate descriptions of the data (e.g. means, standard deviation and range), as well as to test for the direction and strength of association between variables (correlation, regression). The relative influence of a variable or variables on specified outcome, and the likelihood of certain outcomes occurring, was assessed using tests for significant differences (Chi-square) in outcomes.

The choice of Chi-Square test as the main test in this study was influenced by the nature of the data, most of which was categorical and therefore not suitable for other computations. The Chi-square analysis is a statistical test that compares observed data with data we would expect to obtain according to a specific hypothesis. The level of deviation of the observed from the expected gives an indication of the likelihood that factors other than mere

chance are at work in influencing the observed effect or outcome. In addition to the Chi-square test, correlation tests were used to examine the extent to which two variables (a predictor and an outcome variable) were influenced by each other. A strong correlation (as indicated by a correlation coefficient (r) above 0.6) indicated that a change in one of the variables influenced a change in the other to a substantial degree. Correlations could be understood as existing in two directions, positive and negative. Positive correlation means that an increase in one factor leads to an increase in the outcome variable, while in the case of negative correlation as one factor is increased, the other decreases.

3.5 Limitations of the Study and Positionality Issues

3.5.1 Limitations

The hallmark for all science is the rigorous search for evidence to contradict prior assumptions and hypotheses (Murphy and Dingwall, 2003:206). To ensure scientific rigour, the limitations to the study are discussed, and should be taken into account in the interpretation of the findings of this research. Some of these limitations are generally consistent with conducting qualitative research, while others were unique to the sampled case study locations and the concepts studied.

1. The research assistants were drawn from within the targeted EPAs. However, where this was not possible as a consequence of the low

English language literacy in some villages, extension officers from the Ministry of Agriculture and Food Security were recruited. The risks associated with using extension officers in the study was that they may have been overly familiar with the field situation and as such introduced some level of bias to the research outcomes. To counter this, extension officers were only recruited to conduct the survey in a village other than their usual duty station and where they were not immediately recognisable as extension staff. The advantages of working with extension officers far outweighed the potential limitations. While the study recognised that the extension officers may have had some sort of power in the research process, on the basis of their position, with potential ramifications on the responses obtained, the training provided, structure of the questions in the questionnaire, and supervision by the researcher counted this effect.

2. Limited fluency in local languages on the part of the author meant that some responses in focus group discussions had to be interpreted before the discussion proceeded. Such disruptions may have 'killed' the flow of ideas and disconnected issues to some extent. The richness of the data was, nonetheless, not compromised given the breath of participants interviewed. With progression of field work, language skills became less of a challenge, especially in Mzimba where the author could converse either in English (given high English literacy) or Zulu (Zulu is similar to Ngoni spoken in parts of Mzimba). In some initial

interviews, for example, the English interpretations appeared too brief or sometimes more concise than required by the researcher. In such encounters, the asked question and its local language translation, as well as the response and its English translation were all considered to verify the precise questions received by the participant and their stated response. This back and forth translation and transcription of interviews enabled the researcher to minimise the background noise in the research questions that may have been introduced by the interpretation process. Likewise, with the progression of the study the author's command of the language had greatly improved to an extent that follow-up questions could be asked without need for interpreter. In most cases, the attempt by the researcher to ask questions directly (in the local language) without the need for interpretation often struck a warm and conducive environment for a meaningful discussion.

3. The study coincided with the peak of food insecurity as the previous year had been a poor season, especially in Nsanje. Reported food availability and perception of worst drought experience may have been influenced by the current situation.

4. Secondary data available through various stakeholders was not always compatible in terms of scale at which indicators were reported. The choice of measures was not always consistent across seasons or years. This minimised capacity for valid trend analysis at a local level.

5. Some of the communities that were interviewed have been exposed to too many surveys, and in the process appear to have developed within them 'experts in responding to survey interviews'. One participant in Mbadzo village in Nsanje asked the author whether a community resource mapping exercise was going to be done. Over-exposure to research comes with its own biases to the study, especially where previous participation has culminated in new development projects being initiated.

3.5.2 Positionality

Mullings (1999:337) argues that a researcher's knowledge is always partial because of their positionality which is manifested through such identifiers as race, class, gender, nationality and sexuality, among others. Awareness of one's positionality in the landscape within which the research is undertaken is very critical in ensuring the objectivity and validity of evidence so produced through, for example, managing power relations in the field. The key argument is that by reducing to minimum the status difference between the interviewer and the respondent and developing a more equal relationship based on trust, the 'hierarchical pitfall' is avoided thus enabling better openness and insight, a wider range of responses and generally richer data (Renharz, 1992). In consideration thereof, two issues emerged as particularly important:

2.5.2.1 Researcher's identity

On inception of the research, I was cautious that my academic background (agriculture and international development project planning) coupled with my work experience (initially as a Scientific Officer at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and later as a Project Manager within a management consultancy firm with responsibility of evaluating food security and livelihood projects) could potentially influence my perception of reality and interpretation of findings. In addition to this, my identity as an African and Zimbabwean brought in another dimension. For example, knowledge of cultural practices was assumed. Some research participants questioned why a Zimbabwean instead of a Malawian researcher was conducting this study, while others in response to questions posed by the author, attributed poverty and food insecurity in Malawi to colonial biases in favour of Zimbabwe, particularly with regards to farm labour migration into Zimbabwean tobacco and tea estates.

The 2005 food crisis in Malawi was blamed on the president of Malawi's decision to 'feed Zimbabwe instead', referring to the 300 000MT maize export to Zimbabwe made by Malawi on the advice of the International Monetary Fund. That decision is blamed for food supply shortfalls in Malawi, since the food stocks had been overestimated. These perceptions by participants enriched discussions but may have influenced interpretations of issues by research participants and researcher. As such, I acknowledged these assumptions, beliefs and values but aimed at remaining as objective as

possible in order that I could better understand the differences and different meanings. My objectivity was to a large extent guided by consistent focus on the conceptual framework for the study and the questions developed prior to the field exercise.

2.5.2.2 The researcher as an expert

Despite the broad understanding of research as a process of systematic data collection, the experiences in the field indicated a more dynamic role for the researcher. Within the context of rural farming communities the researcher was asked and expected to provide such information as seasonal forecasts, advice on farming and disaster risk reduction as well as comments and recommendations on on-going efforts in agriculture and food security. This situation presented challenges in the sense that if extension advice provided by researcher conflicted with the advice acquired locally then this would appear to undermine local capacity or create mistrust and confusion. Issues of interest to farmers and areas for capacity building were documented and shared with extension officers as exit feedback. The researcher's positioning as a student learning from communities' experience created a good environment for data collection.

With key informant interviews, however, data collection was facilitated by the capacity of the researcher to display some knowledge of the field and capacity to analyse local issues and ask relevant questions. However, this situation required a delicate handling to minimize error arising from key

informant assuming knowledge and thus withholding data, while simultaneously 'creating a space where researchers and their subjects see each other as equals' (Mullings, 1999:340) thus permitting the researcher a temporary insider positionality to facilitate a beneficial exchange or flow of information.

3.6 Reliability of data and research findings

In cognisance of the limitations of the study and the positionality issues encountered, a set of measures was put in place to ensure validity, reliability and trustworthiness of the research process and outputs.

1. **Pilot testing:** The draft questionnaire was translated into Chichewa (local language) and pilot tested in Zomba EPA, an agro-based rural location just outside the town of Zomba in southern Malawi. Within the time and resources available, only eight questionnaires could be administered in the pilot survey. Emphasis was placed on issues critical to the quality of the questionnaire such as (1) identifying questions that were either too difficult to ask or ambiguous; (2) assessing whether the same question was asked consistently by all research assistants, and that this question had the same meaning as intended; (3) identifying new categories of possible responses that had to be added on; (4) checking whether instructions were clear and skip rules were applied were relevant and followed; (5) observing the entire interview from introduction to

completion, including timing of the duration of interview. Following the pilot test, the questionnaire was revised accordingly to include new categories, scales, closed questions in place of open, and a test run on SPSS performed to ensure that the format of the questionnaire would enable performance of relevant statistical tests.

Following the pilot survey, the questionnaire was revised to take into account the factors listed above. Revisions made included addition of new categories, scales, close-ending questions and exclusion of some questions that appeared to be asking the same thing. The data from the pilot survey was entered into the SPSS and test runs for data compatibility and suitability of format for various statistical analysis checked.

2. **Triangulation of data:** To attain more accurate and rounded set of measures, Denzin and Lincoln (1994) suggests the use of triangulation, or methodological pluralism. Triangulation involves using multiple data gathering methods to produce complimentary measures of concepts thereby reducing the margin of error. The present study adopted a mixed methods approach through which data was generated from a combination of household level questionnaire interviews, community level FGDs, key informant interviews and secondary data sources. By comparing data from these multiple sources, verification of responses was possible, and further probing questions were identified.

In addition to the use of multiple methodologies, multiple sources of data were used to obtain a balanced perspective. The multiple sources of data were identified through an initial stakeholder mapping exercise, and are identified in **Table 3-6**. The representation of multiple voices provided the means of verification of facts and alternative perspectives on issues of concern in the study, thereby a more representative picture.

3. **Identification and training of research assistants:** Research assistants were selected from within the Ministry of Agriculture and Food Security in the EPAs selected for the study. To minimise bias resulting from being familiar with the community and its issues, the research assistants recruited were not based in the selected villages. Selected research assistants had proficiency in local languages and English to facilitate effective communication with both the research participants and the researcher.

   All the research assistants that participated in the current study were experienced in field data collection. The MoAFS conducts fortnightly food security assessments during the lean season [September to March] and NGOs and research institutions normally work with extension officers in conducting surveys within the rural districts. Training was provided to all research assistants recruited for the study. Research assistants were oriented on the scope and objectives of the study, the

research instruments used [question by question], quality management issues and ethical issues relating to confidentiality and conduct.

4. **Verification of questionnaires and debriefing meetings:** At the end of each field day, completed questionnaires were checked by the researcher to ensure that all the relevant questions had been responded to and missing responses appropriately coded to minimise post-coding errors, as well as identifying any problems with data collection. A debriefing meeting and informal discussions over dinner with the research assistants at the end of the day were an opportunity to reflect on the experiences of the day, ask questions and get clarifications on some of the observations.

5. **Use of unobtrusive methods:** Payne and Payne (2004:229) note the following about obstructions during the process of data collection:

   'The presence of an interviewer modifies their reported position, because they react to under scrutiny. They might withhold socially unacceptable views; act the way they think researchers want to study; become self-conscious about audio recorders, respond to questions in a routine fashion; or just modify activities to accommodate the presence of a researcher in a confined space'.

To reduce the margin of error due to obstruction during data collection, the following measures were taken:

(a) The purpose of the research was clarified at the onset of interviews and group discussions to ensure that any possible expectation from the study was clarified.

(b) Permission to use the voice recorder was sought prior to conducting interviews and respondents assured that their contributions would be used anonymously.

(c) Researcher and assistants, especially females, were in simple and culturally acceptable dress code. Previous experience had shown that fancy clothing and electronic gadgets may distract the respondents from the interview.

(d) A maximum of five interviews per day was conducted by each research assistant to reduce the effect of 'being hurried'. Interviews and discussions were arranged at least a day in advance to minimise the research impact on livelihoods and coping strategies and optimise cooperation.

(e) Depending on community preferences, men and women were interviewed in either separate or single groups. The issue of male respondents interviewing male respondents was irrelevant to this study.

(f) Although community resource mapping is a common technique in rapid rural appraisal, in some focus group discussions in Nsanje it was difficult to find literate volunteers to write on the flip chart. Some

respondents appeared uncomfortable having to 'go back to the school'. To reduce this obstruction, this component of participatory data collection was excluded in following sessions and only verbally addressed.

3.7 Ethical Considerations

Ethical issues relevant to the study were guided by the University's Code of Practice for Research on Human Participants and the Ethics and Research Governance Policy. The requirements of these were successfully met prior to fieldwork. In addition, the immigration statutes specified that the researcher had to be affiliated to the Chancellor College, University in Malawi in order to obtain a permit to operate as a researcher in the country. Of ethical relevance was the consideration that most of the participants would be drawn from vulnerable groups within the sampled study sites and as such it was important that due consideration in terms of their protection was taken. To ensure validity of findings of this research, a number of considerations summarised in **Table 3-7**were made, as guided by Patton (2002).

Table 3-7: Adherence to ethical standards

Ethical concern	Description of how this was achieved
Explaining purpose	The purpose of the study was explained to all relevant authorities including the affiliate institution, district administrator, police, district extension office heads, chiefs and village heads prior to accessing the field. Prior to any data gathering, respondents were made fully aware that the research had no influence on food assistance programming and was merely for the purpose of gaining deeper understand of the realities.
Promises and reciprocity	The researcher made clear that there were no direct benefits for participating in the survey and as such no promises of 'benefit' were made. Participation was voluntary.
Risk Assessment	Sensitive questions were identified through pilot study and appropriate sources of data mapped. Selection of respondents was openly done so that community members realised that the respondents were drawn by chance, and therefore not in any way victimised.
Confidentiality	A numeric coding system was designed for identifying respondents in order to maintain confidentiality. Pseudo names have been used in the thesis to protect the respondents from potential negative repercussions associated with the views they expressed.
Informed consent	Permission to proceed with interview was sought, and the likely duration of the interview provided prior. Individual interviews were held privately, while focus groups were conducted in the usual public meeting places but without the interference of non-participants.
Data access and ownership	Data generated through this research is to be used for the production of doctoral thesis. The data will be stored for a reasonable period of time (5-10 years) after which it will be destroyed. A copy of the thesis will be held at the University of Malawi.
Interviewer need for debriefing	Debriefing meetings with research assistants were undertaken on a daily basis for the purpose of sharing information/observations made, highlighting some challenges faced in the implementation of the study and ensuring that an accurate account of reality prevailing in the field was recorded. Based on appropriate consultation the researcher provided guidance on how field situations would be managed. The debriefing meetings also provided an opportunity for the researcher to give feedback on the quality of documentation of data being collected, seek verification on unclear issues or engage the group in assessing specific situations.
Confidant and advisor	The University of Malawi played the role of providing guidance on various issues relating to field work. The researcher worked closely with a Research Fellow at the University and received key advice relating to identification of support staff and accessing key documents.
Data collection boundaries	The pilot survey identified sensitive questions which were subsequently removed from the survey instruments. The research made use of publicly accessible data and reports. Permission to use a voice recorder or take photographs was sought from the interviewee prior to use of device.
Ethics versus legal	This research was guided by the University of Dundee's Code of Practice for Practice for Research on Human Participants and the Ethics and Research Governance Policy.

Chapter Four

Vulnerability to Stressors Inducing Food Insecurity

4.1 Introduction

This chapter tackles the first objective of this thesis as set out in Chapter One. It does this by identifying the long term and proximate factors that underpin vulnerability in Nsanje and Mzimba. This is done through use of primary data collected through the use of questionnaire based household interviews, focus group discussions and key informant interviews described in Chapter Three. The chapter combines qualitative and quantitative data to describe the proximate factors that influence food insecurity at household level and to explore the underlying drivers and feedbacks that produce and reinforce vulnerability to drought-induced food insecurity. In the first instance, the main shocks to which the local food system is exposed are described. Thereafter, the events and processes occurring at different temporal, spatial and institutional scales that have produced the current vulnerability are critically analysed from historical, socio-cultural, economic, political and environmental perspectives. While institutions, by virtue of governing resource access and decision making, are relevant to this discussion, a section dedicated to this issue is contained in the next chapter. The conclusion will seek to relate the concept of vulnerability to that of resilience in the context of socio-ecological systems.

4.2 Manifestation of vulnerability to food insecurity

Vulnerability to food insecurity in the study areas is manifested by the extent of household level reliance on food stress-related coping strategies and other indicators such as proportion of undernourished children under the age of five years. Five food stress coping strategies used by the respondent group were reduction in meal size and meal frequency (70%); increasing dependence on casual labour or ganyu for food (52%); restricting consumption of adults in favour of children (35%); harvesting and consuming immature food crops (34%) as increased reliance on non-preferred and in some cases unsafe food (32%). Based on these indicators, **Table 4-1** indicates that Nsanje had substantially higher food stress than Mzimba.

Table 4-1: Food stress coping mechanisms used in Nsanje and Mzimba

Coping strategy	% of households using coping mechanism		Total	Difference
	Nsanje	Mzimba		P-value
N	100	95	195	
Reduced consumption	82.7%	57.9%	70.0%	0.000
Restricted consumption	49.0%	21.1%	35.0%	0.000
Consumption of less preferred food	32.0%	20.0%	26.0%	0.040
Distress food sourcing methods	14.0%	13.7%	14.0%	0.557
Dependence on ganyu for food	63.0%	41.1%	52.0%	0.002

Source: Author, 2011

NSO (2008) reported that one in five children under the age of five in Malawi was underweight, and almost one in every two was stunted in 2006. In Nsanje and Mzimba, underweight children were 24.6% and 18.3% of all children below five. While stunting affected more children in Mzimba (38.5%) than in Nsanje (38.5%), wasting was higher in Nsanje at 4.1%.

Mzimba had almost four times more overweight children (7.6%) than Nsanje (2.1%). These figures are derived from the 2006 Multiple Indicator Cluster Survey. It is important to note that in 2005 Malawi faced one of the worst food crisis ever experienced, with 34% (4.2 million) of the population unable to meet their food needs (FAO, 2005).

Table 4-2: Nutritional status of children under five in Nsanje and Mzimba

	Underweight%	Stunting%	Wasting%	Overweight%
Malawi	20.5	46.0	3.5	6.1
Nsanje	24.6	38.5	4.1	2.1
Mzimba	18.3	46.2	3.1	7.6

Source: Multiple Indicator Cluster Survey, 2006

4.2.1 Food Availability

The majority of respondents, particularly those in the lower socioeconomic groups, were found to be net food purchasers in terms of the main staples, maize and cassava. **Table 4-3** shows that 68.4% of all respondents produced less than 50% of the food they consumed in 2009/2010. The proportion of households producing less than half of their annual food requirement was much higher in Nsanje (77.7%) than in Mzimba (58.6%).

Table 4-3: Proportion of all food consumed in the household produced by the household

Proportion from own production	District		
	Nsanje	Mzimba	Total
N	99	94	193
Less than 25%	34.3%	16.0%	25.4%
25-50%	43.4%	42.6%	43.0%
51-75%	9.1%	22.3%	15.5%
More than 75%	13.1%	19.1%	16.1%
Total	100.0%	100.0%	100.0%

Source: Author, 2011

Regardless of low production levels, and awareness that available stocks were inadequate, poor households sold part of their production to meet household cash income needs. 21.6% of respondents in Mzimba and 6% in Nsanje sold food crops under distress. Limited capacity for postharvest processing and, consequently, short shelf life, often led to market flooding and depressed producer prices.

Respondents identified the duration with food based on their own production as a suitable indicator of food security. Mzimba had 3.5 times more respondents with food availability surpassing three months compared to Nsanje **(Table 4-4)**. In Nsanje, 34.3% of all respondents did not harvest enough food to last a month, and a further 38.4% ran out of food within three months of harvesting. By comparison, households in Mzimba were more food secure, with only 6.4% running out of food in less than 3 months of harvesting, and 36.8% having enough food to last until the following harvest.

Table 4-4: Duration with adequate food availability

Duration with food based on own production	District		
	Nsanje	Mzimba	Total
N	99	95	194
0 months	34.3%	3.2%	19.1%
Up to 3 months	38.4%	3.2%	21.1%
Up to 6 months	17.2%	21.1%	19.1%
Up to 9 months	7.1%	35.8%	21.1%
Up to 12 months	3.0%	36.8%	19.6%
Total	100.0%	100.0%	100.0%

Source: Author, 2011

Food security in Malawi is generally considered in terms of sufficiency of maize stocks. 84% of all respondents interviewed had planted maize during

the 2009/2010 agricultural season. Yields attained ranged from 0 $kgha^{-1}$ (indicating total crop failure and no grain harvested), to 7875 $kgha^{-1}$. The average yield for the sample population surveyed was 1117 $kgha^{-1}$. **Table 4-5** shows the proportion of households falling within the different yield categories.

Table 4-5: Maize yield per hectare for Nsanje and Mzimba 2009/2010 season

	Nsanje		Mzimba		Total	Total
Maize Productivity	Count	% within district	Count	% within district	Count	%
N	69	100%	95	100	164	100%
0$kgha^{-1}$	48	69.6%	6	6.3%	54	32.9%
1-1500$kgha^{-1}$	17	24.6%	45	47.4%	62	37.8%
1501-3000$kgha^{-1}$	2	2.9%	26	27.4%	28	17.1%
3001$kgha^{-1}$ plus	2	2.9%	18	18.9%	20	12.1%
Total (N)	69	100%	95	100%	164	100%

Source: Author, 2011

Almost 70% of respondents in Nsanje suffered from total maize crop failure in 2009/2010 farming season with drought being cited as the major factor. A quarter of all households sampled in Nsanje harvested up to 1500kg per hectare. In Mzimba yields were much higher; total crop failure affected 6.3% of households sampled, and a total of 46.3% harvested more than 1500kg per hectare. **Table 4-6** provides descriptive statistics for maize production.

Table 4-6: Summary statistics on maize yield in Nsanje and Mzimba

	N	**Minimum**	**Maximum**	**Mean**	**Median**	**SE of mean**
Nsanje	100	0.00	840	51.060	0.000	1.41452E1
Mzimba	92	0.00	5400	1027	6.0000E2	1.14769E2

Source: Author, 2011

The maximum maize production was 840kg in Nsanje and 5400kg in Mzimba. Mean production was 51kg and 1027kg for Nsanje and Mzimba, respectively. Using the modest FAO estimates of 148kg per capita maize consumption, an average household of four members requires at least 592kg

per year. At this consumption level, the proportion of households incapable of producing sufficient stocks was substantial in Nsanje.

4.2.2 Food Accessibility

Table 4-7 shows that 56.4% of all respondents lived within 5 kilometres of the main food market. Based on the sampled villages, Mzimba had 31.9% of respondents within a kilometre from a food market, compared to 10.1% in Nsanje. Proximity to the market, especially in the absence of flooding rivers, enabled better food access assuming that cash was available. Respondents in both study areas reported that those located closest to the food markets in both districts had better access to market intelligence on food deliveries in drought years and stronger connections with networks through which food could be accessed. This was, however, dependent on household socioeconomic status, because richer households were seen by respondent groups as likely to have connections translating to resource access, while poorer households needed connections for accessing ganyu.

Table 4-7: Location of household relative to main food market

Distance to market	District		Total	Cumulative
	Nsanje	Mzimba		
N	99	94	193	
Less than 1km	10.1%	31.9%	20.7%	20.7%
Less than 3km	12.1%	7.4%	9.8%	30.5%
Less than 5km	35.4%	16.0%	25.9%	56.4%
Less than 10km	24.2%	35.1%	29.5%	85.9%
Less than 20km	11.1%	7.4%	9.3%	95.2%.
More than 20km	7.1%	2.1%	4.7%	100%
Total	100.0%	100.0%	100.0%	100%

Source: Author, 2011

Respondents also indicated that those living near the commercial hub had better petty trade opportunities, e.g. through market gardening or selling various food and non-food items. Further, as distance from the commercial hub increased, so did the costs of accessing food. Given the poor transport infrastructure, longer distance from the market was associated with higher chances of crop produce spoilage which often led to lower market prices. 72.7% of respondents in Nsanje and 61.7% in Mzimba found the market easily accessible (**Table 4-8**).

Table 4-8: Perception of ease of accessing food market

Easy to access food market	District		Total
	Nsanje	Mzimba	
N	99	94	193
Agree	72.7%	61.7%	67.4%
Disagree	27.3%	38.3%	32.6%
Total	100.0%	100.0%	100.0%

Source: Author, 2011

Market food access is income-related. This is relevant in the study areas considering the high proportion of households who are net food buyers. 59.2% of households in Nsanje and 12% in Mzimba spent more than 50% of their income on food. Any disruption of income, therefore, would have a direct consequence on food purchasing power. The proportion of income spent on food is shown by district in **Table 4-9**.

Table 4-9: Proportion of income spent on food

Proportion of income	District		Total
	Nsanje	Mzimba	
N	98	83	181
Less than 25%	10.2%	45.8%	26.5%
25-50%	30.6%	42.2%	35.9%
51-75%	26.5%	6.0%	17.1%
More than 75%	32.7%	6.0%	20.4%
Total	100.0%	100.0%	100.0%

Source: Author, 2011

Irrespective of availability, social values and food taboos determined who had access to what food at individual level. These food taboos differ mainly by gender and age. **Table 4-10** lists some of the popular food taboos and consequences for non-compliance.

Table 4-10: Food access limiting taboos in Nsanje and Mzimba

Taboo	Belief or expected outcome
Eggs should not be eaten by young children, girls or expectant mothers	Children will become thieves; Girls who grow up eating eggs are likely to be barren as women; In expectant mothers, eggs may cause women to give birth to bald-headed children.
Pregnant women are encouraged to eat fish (*mlamba* or catfish in particular)	Easting slippery fish enables a 'slippery delivery 'and prevents miscarriages.
Pregnant women should not eat left-over food	Leftover food should be given to children; in pregnant women it creates problems in delivering.
Expectant mothers should not consume red pumpkins	Eating a pumpkin during pregnancy is believed to lead to breached delivery where the child comes out legs first. Others consider this a bad omen.
Pepper should not be taken by expectant mothers	Taking pepper may cause the baby to be born with blood shot eyes.

Source: Author, 2011

Younger mothers revealed that decisions on what children eat were usually made by their mothers-in-law. For example, the mothers–in-law determined the duration of breast feeding as well as the onset of solid food and its composition. As a consequence of social values, the education of the mother

may have limited effect on nutrition of their child as other social actors are more influential.

4.2.3 Food utilisation

Indicators of food utilisation focused on the nutritional value of food and the status of health and hygiene. In terms of dietary composition, maize is the most important staple food cultivated, marketed and consumed in the two districts studied. **Table 4-11** shows that nearly all (98.9%) of households in Mzimba relied on maize as the main food staple, despite the district being also known as a cassava growing area. According to qualitative interviews, cassava is poorly regarded as a food crop and largely perceived as a 'poor man's crop'. 13.7% of all households in Mzimba planted cassava and only 1.1% consumed it as their main staple food. For the rest, cassava was largely consumed in place of bread or as a snack between meals.

Table 4-11: Main food staple consumed by households in Nsanje and Mzimba

Food crop	Nsanje	Mzimba	Total
N	98	94	192
Maize	79.6%	98.9%	89.1%
Cassava	.0%	1.1%	.5%
Sorghum	10.2%	.0%	5.2%
Millet	10.2%	.0%	5.2%
Total	100.0%	100.0%	100.0%

Source: Author, 2011

In Nsanje, on the contrary, the diet was more diversified with maize dominating as the main staple food (79.6%) while sorghum and millet, which are generally drought tolerant crops, each supporting 10.2% of the study

sample. Cassava was absent as a staple food in Nsanje, while in Mzimba millet and sorghum were primarily used for brewing local beer.

Respondents argued that while maize was the most preferred food, consuming preferred food was of secondary concern. Nonetheless, in Mzimba, respondents reported preference for *nsima,* or thick porridge made from maize flour, derived from local maize rather than hybrid maize as they found local maize both better tasting and lasting longer in the stomach. It was stated that non-application of inorganic fertiliser or storage chemicals, in preference for manure fertiliser and ash storage, allowed retention of natural flavour. For the same volume of maize flour, local maize cooked more servings and was viewed as heavier. Other respondents counter-argued that preference was a preserve for the rich:

> *"When you are hungry you cannot choose, you cannot differentiate between what tastes better and what tastes bad. Those* (statements) *are from people on full stomachs."*Michael Banda*[3], FGD in Manyamula, Mzimba

Food preparation preferences, such as boiling leafy vegetables until they are discoloured to brown, were observed. Several studies in nutrition science have established that the nutrient content in consumed food is determined by the preservation, processing and preparation of the particular food item. According to a food preparation guideline, Rhonda Callow (2010) cautions that boiling and draining vegetables results in a loss of 75% of Vitamin C and folate, 70% of the thiamine and potassium, 65% of the Vitamin B6, 55% of the

[3]Names of respondents reported throughout the thesis have been changed in order to protect the anonymity of respondents and the institutions they represent.

niacin and sodium, 50% of the vitamin B12, 45% of the riboflavin and copper, 40% of the iron and magnesium, and 35% of the vitamin A and phosphorus. The recommended method of vegetable preparation is steaming.

In terms of food safety, respondents appeared more concerned about the effect of pesticides and storage chemicals like *Actellic* on the taste of food, rather than on food safety. It has been reported in the literature that pesticide residues may be persistent on food and if consumed may suppress the immune system especially for people living with HIV and AIDS (e.g. Repetto and Baliga, 1996). Utilisation of consumed food is sub-optimal for individuals with low health status. The incidence of chronic and acute illnesses was used as proxies for food utilisation capacity for individuals within targeted households.

Table 4-12: Households with incidence of ill-health

District	Chronic illness	Malaria	Diarrhoea
Nsanje	17.2% (N=99)	65.3% (N=95)	26.5% (N=98)
Mzimba	26.6% (N=94)	46.8% (N=94)	21.3% (N=94)
Total	21.8% (N=193)	56.1% (N=189)	24.0% (N=192)
P value	0.079	0.008	0.247

Source: Author, 2011

21.8% of all households reported at least one case of chronic illness, often associated with tuberculosis and HIV/AIDS. As shown in **Table 4-12**, in the twelve month period prior to the interview, malaria affected 56.1% of all households in the two districts with Nsanje being significantly more affected (65.3%) than Mzimba (46.8%). One in four households interviewed had at least one member suffering from diarrhoea. The incidence of diarrhoea is itself an indication of contaminated food. Individuals affected by any of the

three conditions would be potentially less able to fully utilise the nutrients supplied through food consumed. While social norms such as shaking hands and eating from the same plate were identified as essential for strengthening social bonds by community members, they were criticised for spreading diseases like diarrhoea. One FGD respondent remarked:

> *"Eating from the same plate, or drinking from the same gourd is safer than eating individually as it made it difficult for one to get poisoned (as this would mean poisoning the whole group)".* Masauso Kaitano*, FGD, Vibangalala, Mzimba

In Nsanje, some unsafe food stress coping mechanisms such as adding sleep-inducing wild fruit to children's porridge to keep them in bed for longer, and reduce their "constant nagging" for food were resorted to under intense food insecurity. Some poor households mentioned having consumed husks produced by maize milling when faced with food shortage in the past.

4.3 Proximate factors influencing food (in) security

The previous section demonstrated vulnerability to food insecurity in the study areas. Here the focus is on identifying the proximate factors influencing the observed food insecurity in the study area. Factors considered encompassed four key and interrelated elements: climatic, agricultural, labour and social factors.

4.3.1 Climatic factors

Droughts, dry spells and floods were identified as substantial factors influencing all three components of food security in the study areas. The impacts of droughts and floods may be immediate, e.g. occurring within a farming season, or long term. Within and across the two districts covered, considerable differences in the nature and effect of climatic factors on food security were observed. **Table 4-13** shows that 96% of respondents in Nsanje and 69.7% in Mzimba identified drought as a factor that had affected household food security in the 2009/2010 consumption year. In contrast, floods affected 40% and 23.6% of respondents in the two districts, respectively.

Table 4-13: Proportion of households affected by climatic shocks

	Location			Difference	
	Nsanje	Mzimba	Total	Chi-Square	p-value
N	100	95	195		
Drought	96.0%	42.1%	69.7%	67.059	0.000**
Floods	40.0%	6.3%	23.6%	30.667	0.000**

**Significant at the p=0.01 level; 2 tailed

Source: Author, 2011

4.3.1.1 Droughts

Respondents in Nsanje and Mzimba gave different perspectives on the problem of drought on food security:

> *"Last season we did not harvest anything. We planted but rains could not come. Instead we got an intense heat which resulted in withering of crops and scorching".* Maria Chimkango*, FGD, Nsanje

> *"Yes, drought is a problem, but not big enough to surpass flooding"*.Edson Chibisa*, FGD, Nsanje
>
> *"This place was not meant for human habitation. It's too hot, floods and droughts are common and there are too many mosquitoes. Even the soils are not meant for agriculture, this should have been a game reserve"*. Zocheza Bitoni*, Village development committee member, Nsanje
>
> *"Sometimes after planting it takes two months before even a drop is received"*. Victoria Moyo*, FGD, Mzimba
>
> *"At times the rains start well but stop right in the middle of the season, burning everything. If you do not have seeds to replant then you get nothing, but sometimes you replant and still get nothing"*.Kennedy Nyirenda*, FGD, Mzimba
>
> *"Sometimes they tell us it will rain, and it sure does rain...elsewhere, not here"*.Waleke Alfred*, Village headman, Nsanje

The five responses above provide insight into the processes through which drought impact is produced and by whom such impacts are felt. Maria Chimkango emphasises the effect of lack of rains affecting production capacity, a sentiment widely shared especially by households with no access to *dimbas* (wetlands), irrigated fields or flood plains. As such, in the absence of irrigation, poor rains are directly linked to poor harvests. However, even within the same local area, household specific characteristics appeared to determine what households perceived to be the main constraints to food security. Edson Chibisa in Nsanje, for example, perceived floods as more disastrous to food security than drought.

The view of Nsanje as being inhabitable by Zocheza Bitoni suggests that some locations, by virtue of the range and magnitude of shocks to which they are exposed, have the conditions which limit opportunities for

generation of livelihoods or production of food. Inhabitants in such locations are likely to be vulnerable to food insecurity induced by such shocks as droughts given their socioeconomic and other conditions. Victoria Moyo and Kennedy Nyirenda both highlight the economic dimension to poor rainfall distribution. Long mid-season dry spells on non-drought years often led to total crop burnout, or premature flowering which translated to low harvests. Having capacity to replant seeds following a dry spell improved chances of obtaining a harvest, but this was not always the case. Other respondents perceived good harvests as increasingly dependent on luck. One respondent described farming as similar to playing a game of poker, arguing that farming was increasingly unpredictable and there was no clear winning formula but mere luck.

4.3.1.2 Floods

Floods are experienced on a frequent basis in Nsanje. **Figure 4-1** is a picture showing years when floods were officially declared. Nsanje experienced floods in the years 1956; 1967; 1976; 1986; 1986; 1989; 1995; 1996; 2001; 2002; 2007. 2011 was also a flood year. This data shows that while flood occurrence was decadal between 1956 and 1986, thereafter occurrence appears more frequent. This picture is consistent with the version reported by the study's respondents.

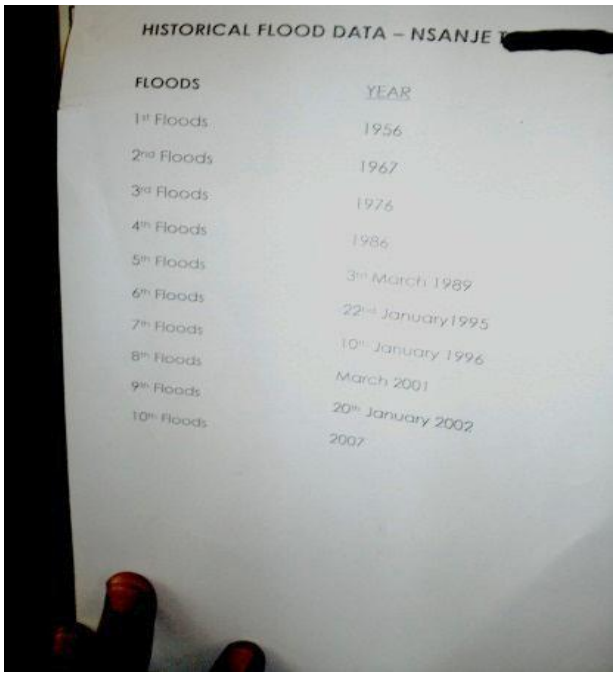


Figure 4-1: Flood history of Nsanje

The initial impression on arrival in the field was that floods occurred in the same locations that were affected by drought, thereby producing double exposure and double impact, such as asset loss and food productivity decline. The double exposure was confirmed by a Chi-square test which revealed that 30.9% of the study sample was affected by both droughts and floods, as shown in **Table 4-14.**

Table 4-14: Proportion of households affected by drought and floods or both

			Drought		
			No	Yes	Total
Floods	No	Count	55	94	149
		% within Drought	93.2%	69.1%	76.4%
	Yes	Count	4	42	46
		% within Drought	6.8%	30.9%	23.6%
Total		Count	59	136	195
		% within Drought	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	13.262(b)	1	.000		
Continuity Correction(a)	11.959	1	.001		
Likelihood Ratio	15.668	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	13.194	1	.000		
N of Valid Cases	195				

a Computed only for a 2x2 table
b 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.92.

Table 4-14 shows that of the households affected by floods, only 6.8% were not affected by drought. Of all households that reported being affected by drought, 30.9% were also affected by floods. The Chi-square test showed a strong difference between these two groups (Chi square=13.262; df=1; p-value=0.000).

In Mzimba floods were predominantly flash in nature and highly localised in terms of spatial coverage and impact. On the contrary, Nsanje experienced both flash and slow onset floods which covered large geographical areas and affected villages located in the lowlands. Siltation of the rivers in Nsanje due to a combination of factors including deforestation and stream bank cultivation were cited as the main drivers of flooding. **Figure 4-2** shows a heavily silted river bed in Nyachilenda, Nsanje.

Source: Author, 2011

Figure 4-2: Siltation along Nyachilenda River in Nsanje increases flood risk

On closer examination of the impact of floods in the study areas, it became clear that there were winners and losers produced by floods. Household level outcomes due to flooding differed, as illustrated by the following FGD and key informant interview responses:

> *"Floods are experienced almost yearly and they have a big impact on our lives. We are not settled, as opposed to the past where flooding would occur at least once a decade. We had floods in 1962, 1978, 1989, 1987, 2001, and 2002. Nowadays it seems like it floods almost annually".* Mulimbe Solana*, key informant interview, Nsanje

> *"Firstly, crops and gardens are washed away, then kitchen utensils, food, blankets, and everything else is lost".*Anna Phiri*, FGD, Nsanje

> *"The problem is because of heavy downpours. But also there was a big dyke which was built before Dr. Kamuzu Banda, came. Now that ridge is no longer there, and our fields and homesteads get flooded. The ridge was destroyed because of cultivation along the river bank".*Edward Kanjana*,key informant interview, Nsanje

> *"I have a house in Nyachikadzi located in the upland, and another one here in the marshes which are flood prone".*Lakiyoni Smart*, FGD, Nsanje

> *"Floods are a blessing in disguise, drought and no floods like this year 2010 is bad, but drought and floods is good because we can always use residual moisture for cultivation".* Beni Luwayo, key informant interview, Nsanje
>
> *"We live with problems. We normally go back to the flooded area and try to cultivate whatever food crops we can manage.* Samantha Jeke, FGD, Nsanje

Mulimbe Solana suggests that the frequency of flood occurrence has increased in recent years. Changes that have driven this increase include siltation in major rivers as a result of river bank cultivation to produce more food. According to Edward Kanjana, river bank cultivation destroyed the physical structure that directed flood water away from human settlements and fields. It appears from the responses that, even though it is not clear whether the destruction of this physical barrier was intentional or not, some social groups are benefiting while others suffer serious losses from floods (despite the inevitable general flood associated loss suffered across all groups across all groups). Households with access to flood plains often waited for floods to recede before planting, and were capable of growing crops, including rice and sweet potatoes, all year round. As a result, such households were more food secure than the poorer households living in the same area but with limited irrigable land available, such as Edson Chibisa. Lowland based households with neither a house in the uplands nor land in the flood plain were thus exposed to both drought, through failure to generate food reserve via flood irrigation, and floods, through flood related asset losses. In other words, failure to take advantage of floods exposed individuals to drought-induced food insecurity.

Items lost in flood episodes that were seen as contributory to food insecurity were perceived differently by men and women. As exemplified by Anna Phiri, women were more concerned about items such as kitchen utensils, food and crops while men, even those without, identified livestock losses as some of the most detrimental for food security. Other losses identified from the study included seed loss and, by translation, germplasm loss and failure to produce food in the future or after flood recession. Other losses, as depicted on **Figure 4-3** taken in Nsanje, included the loss of land as the channel extended laterally particularly being promoted by agricultural activities along the river's channel. Reduction in field size was one of the drivers of conflict over land among farmers. Measures such as planting vertiva grass were being practiced to mitigate against the impacts of these fluvial processes.

Figure 4-3: Vertiva grass being used to reduce impact of flooding on crops. Without protection, fields are reduced in size by river action every year

The upland based respondents in Nsanje cited dependence on firewood sale to generate income for food purchases, especially following floods or droughts. Lowland respondents identified firewood sale as a coping strategy that had driven deforestation and produced siltation of rivers thereby increasing flood risk. Interestingly, while deforestation in the uplands was seen as causing flooding in the lowlands, the upland households are being doubly punished through loss of seed, fertiliser and soil to the lowlands. Weed seeds may also be moved to the lowland areas, and respondents in the lowlands reported that the upland villagers provide a large pool of ganyu labour, especially for weeding (weeds originating from their own fields). The lowland villagers by their capacity to take advantage of floods are supporting upland food security and creating a buffer against both flood and drought shocks. In drought years, however, opportunities for ganyu and rates paid tended to be very low thus exacerbating food insecurity.

In addition to climate related hazards, Malawi has also seismic activities that are associated with the country's location at the southern end of the Great Rift Valley of East Africa. Between 6th and 19thof December 2009, Malawi experienced a series of earthquakes of magnitude ranging from 5.4 to 6.0 (on the Richter scale). While the epicentre was in Karonga district where over 1000 houses were destroyed and more than 300 people wounded, effects on food security were felt as far afield as Mzimba, some 300km away.

In response to the earthquake in Karonga, humanitarian organisations purchased grain from farmers in Mzimba and distributed it among affected

people in Karonga. The increase in grain demand as a consequence of NGO purchases pushed the grain prices upwards thus making it unaffordable for poor households. Thus, while the NGOs had perceived local grain purchases as being supportive of farmer incomes in Mzimba, as well as reducing transaction costs associated with food import, the costs to poorer households were insufficiently taken into account. Households that had suffered from either depressed tobacco prices or dry spells affected maize grain yields were more negatively affected. Tremors and earthquakes were associated with destruction of shelter, and in rebuilding; financial and labour resources were diverted away from food sourcing thus increasing risk of household food insecurity. Respondent groups in both districts reported that strong winds are an additional stressor. **Figure 4-4** shows a house destroyed by strong winds in Mzimba.

Source: Author, 2011

Figure 4-4: A house destroyed by strong winds in Mzimba

4.3.2 Agricultural production related shocks

Of the four categories of agricultural production shocks identified in the study areas, respondents in Nsanje were more severely affected (**Table 4-15**).

Table 4-15: Proportion of households affected by production shocks

	Location			Difference	
	Nsanje	Mzimba	Total	Chi-Square	p-value
N	100	95	195		
Livestock diseases	48.0%	31.6%	40.0%	5.474	0.019*
Crop pests	51.0%	26.3%	39.0%	13.165	0.000**
Livestock death	41.0%	27.4%	34.4%	4.014	0.045*
Livestock theft	41.0%	22.1%	31.8%	8.020	0.005**

**Significant at the p=0.01 level, 2 tailed; *Significant at the p=0.05 level

Source: Author, 2011

Livestock diseases and death of livestock affected food security in 40% and 34.4% of all respondents interviewed. In both cases, Nsanje recorded higher proportions of households affected by livestock diseases and death at 48% and 41% compared to 31.6% and 27.4% in Mzimba. Key informants in agriculture and veterinary services lamented that the high disease incidence was influenced by the district's proximity to Mozambique where livestock disease control systems were weaker. Informal cross-border livestock trade was identified as a prominent route for disease transmission between Malawi and Mozambique. For example, the source of Newcastle disease experienced in 2009 and 2010 in Nsanje is believed to have been chickens given as payment for ganyu on Mozambican farms. In June 2011, 5000 pigs with an estimated cost of €116,000 died from swine fever in Rumphi and Mzimba district, and 92000 pigs were classified as being at risk of infection (Animal Health and Livestock Department, in Meat Trade News Daily, 18th

June 2011). The source of the swine fever is believed to be Tanzania, a country that shares its southern border with Malawi, and the facilitating factors include the illegal livestock and meat trade across the border.

Chances of losing livestock to theft were almost twice as high in Nsanje (41%) as they were in Mzimba (22%). This high incidence of stock theft was attributed to high demand for beef in neighbouring Mozambique coupled with weakening community policing and self-centred coping mechanisms as suggested by some of the respondents interviewed in Nyachilenda, an EPA more severely affected by stock theft (**Table 4-15)**. In all cases of related to livestock loss or incapacity, household food security was diminished through loss of unit of exchange for grain in drought years, reduced yield e.g. milk, eggs, meat and loss of draught power for tilling land, thereby reducing land under production and production levels.

In addition to livestock theft, respondents reported that chicken and crops in the fields or storage are often stolen during the lean season when 'normal' coping strategies fail. 10.8% of all households reported losing food to theft in the twelve month period prior to the survey.

In crop production systems, the weevil and larger grain borer were identified as problematic pests with profound effects on crop and food stocks. The larger grain borer (LGB) and maize weevil were pests of high economic importance particularly in Mzimba. This was partly because the preference for ash treated maize allowed stocks of pests to build up and,

additionally, the formal and informal maize imports from Tanzania in 2001 and 2005 when the country faced food crises is believed to have introduced a new and even more virulent strain of LGB. Crop pest damage as a cause of food insecurity was reportedly higher in Nsanje than Mzimba. 51% of households interviewed in Nsanje were affected by pest attack, mostly locust grazing and lack of capacity to control the situation by the Ministry of Agriculture and Food Security (MoAFS).

4.3.3 Labour shocks

Agricultural labour for processes such as field clearance, land preparation, planting, weeding, harvesting and postharvest processing is normally drawn from within the household, pooled or hired from within the community. However, household labour often competes with the ganyu labour market. This competition arises as a consequence of low agricultural yields, weak producer prices for crop products due to the low agricultural incomes from sale of produce on the local market which make an additional income source, through ganyu, a necessity. At the peak of the season, casual labour sells for MWK200 (or GBP0.80) per day (which is equivalent to about 2.5kg of maize grain), or in some cases payment may be in the form of food.

Experience of illness or death within the household was identified as a condition that restricted capability of engagement in ganyu, thereby diminishing food access at a critical time of the consumption year. The study identified cases of illness or death within the household, in the twelve

months prior to the study, which had an effect on household labour availability for livelihoods. The results are summarised in **Table 4-16**

Table 4-16: Proportion of households affected by labour shocks

	Location			Difference	
	Nsanje	Mzimba	Total	Chi-Square	p-value
N	100	95	195		
Illness within household	54.0%	50.5%	52.3%	0.236	0.627
Death within household	10.0%	17.9%	13.8%	2.545	0.111

**Significant at the p=0.01 level, 2 tailed; *Significant at the p=0.05 level

Source: Author, 2011

52.3% of all households reported suffering labour loss due to illness. The main illnesses suffered included malaria, diarrhoea and chronic illnesses such as tuberculosis and HIV/AIDS. Deaths affected a total of 13.8% of all households, with Mzimba having 8% more death incidents reported than Nsanje.

Interviews in both districts revealed that the peak for malaria cases coincided with the peak labour demand thereby constraining labour availability for agriculture and limiting the number of ganyu participants for affected households. Malaria cases are mainly reported between December and March, while labour demand is high between November and April, depending on the rainfall onset and season quality in terms of how this influences weed intensity and the harvest. Respondent groups in both districts reported that larger households were more likely to suffer from any reduction in ganyu participation than smaller households, because smaller households had relatively less demand for food. The exception was in the

case of large households being composed of able-bodied individuals who could all participate in ganyu and thus generate more food.

Social obligations including taking care of sick relatives and attending funerals divert household time and financial resources away from opportunities through which food can be secured, delays farm processes and increases risk of exposure to droughts and other shocks. Funerals, for example, may last up to a week for various reasons. Given the highly unpredictable rainfall regime, inability to plant or apply fertiliser at a certain narrow window, due to social commitments, would directly affect possibilities of a good harvest. Further, while it is a norm that neighbours assist in meeting the costs associated with a funeral, including contributing food for the mourners, bereaving families were expected to slaughter some of the livestock owned to feed mourners, further exposing themselves to other future shocks.

4.3.4 Market shocks

Market shocks were seen as occurring when the household's capacity to demand food on the market was diminished by a combination of factors, including high food prices due to limited supplies, low ganyu rates or reduced income from sale of crop and livestock products. High input costs or unavailability of farm inputs in the market was also considered within this category. Respondents were asked to identify the market shocks that had affected their ability to achieve food security in the 2009/2010 consumption year. The frequencies reporting each shock are indicated in **Table 4-17**:

Table 4-17: Proportion of households affected by market shocks

	Location			Difference	
	Nsanje	Mzimba	Total	Chi-Square	p-value
N	100	95	195		
Unfavourable crop producer prices	16.0%	40.0%	27.7%	14.014	0.000**
Unfavourable livestock market prices	16.0%	23.2%	19.5%	1.591	0.207
Reduced non-agricultural income	32.0%	14.7%	23.6%	8.055	0.005**
Reduced agricultural income	57.0%	47.4%	52.3%	1.812	0.178

**Significant at the p=0.01 level, 2 tailed; *Significant at the p=0.05 level

Source: Author, 2011

While weak crop producer prices were reported in both districts, respondents in Mzimba were significantly more affected with 40% claiming that the low prices in the market had affected their ability to secure food for their households due to diminished purchasing power. In comparison, 16% of respondents in Nsanje were affected. Of note for Nsanje is that tobacco is the main cash crop grown and fluctuations in global market prices and policies have a direct effect on farm-gate prices. In Nsanje, cotton farmers lamented that the drought had affected the cotton yield and quality and grading of cotton was at the preserve of the buyer. The impact of depressed market prices was significant in Nsanje given that maize prices were raised by demand from NGOs and most tobacco growing households often allocated less land for food crops with the hope that incomes from tobacco may be used for food purchases.

In Mzimba, soya bean farmers on a new project failed to market their crop due to failure of demand leading to massive income losses and food insecurity as significant land allocations had been diverted from crop production. Livestock market failure affected food security in 23.2% of

households in Mzimba and 16% in Nsanje. However, food price hikes were of particular concern to Mzimba rather than Nsanje on the basis that, according to food security experts, market integration is perceived to be stronger in the southern than northern districts. This means that in the event of production shortfalls, traders from markets near Nsanje would quickly come in and boost supplies thus maintaining prices within a stable range. In contrast, markets in Mzimba are more atomised, the Karonga example where attempting to bolster one market led to collapse of others, is a testament to weak market integration.

Respondents also noted that in typical drought years, the distance to food market was often longer, as were opportunities for ganyu. However, food imports from Mozambique were associated with both informal and formal duty. Some of the sentiments raised by respondents include the following:

> *"Because of lack of maize here, like last year, we had to go to Mozambique to look for maize. But there are problems; sometimes we are forced to pay an additional fee as we are buying from a foreign country"*.Tobias Smart*, FGD, Nsanje

> *"The market is a bit far. We walk for about two hours"*.Lydia Moyo*, FGD, Mzimba

> *"A cup of beans is sold at K50, that's a big cup. Right now is has gone up to K100"*.Kenneth Maganga*, key informant interview, Nsanje

4.3.5 Social shocks

This category of shocks was included based on field observations that sudden changes in certain social conditions at a household had both short

and longer term bearings on household food security status. Under drought or food stress conditions, for example in Nsanje, marrying off girls in exchange for maize or livestock was identified as a common distress coping strategy under extreme drought. When asked whether the household had used this strategy in responding to past droughts, 14% of respondents in Nsanje confirmed marrying off their daughters for food. The absence of lobola in Nsanje explains why none of the respondents reported marrying off daughters for food. Even in good seasons, marriage had the potential to reduce household food security because the associated fragmentation of land reduced productivity levels through reduced cropping area and reduced labour. In Mzimba, marriage was associated with wealth transfer, where the bride's family received anything between one and five head of cattle as *lobola*. At the same time, respondents also indicated that in drought years the frequency of domestic disputes leading to divorce also increased. Considering the worst drought ever faced, 6.5% of households interviewed in Mzimba, but only 1% in Nsanje, reported experiencing marriage breakdown. Such family breakdowns were seen as likely to reduce overall food productivity levels for either party, particularly for the partner that was sent off and denied access to land for agriculture and productive assets for pursuing other livelihood activities through which food could be secured. Indeed other longer term factors are responsible for marriage breakdown; drought may only be a spark.

8.4% of respondents in Mzimba and 1% in Nsanje were accused of witchcraft in the 12 months prior to the interview. Such accusations automatically lead to exclusion from the social, economic (e.g. casual labour) and political life of the community thereby directly impacting on food and income generation capacity. In some cases, accused persons were expected to make payments in the form of money or livestock, further compromising their already precarious situations.

4.4 Underlying drivers of vulnerability

The previous section showed that vulnerability to food insecurity in Nsanje and Mzimba is largely influenced by the context within which the proximate factors (climatic, agricultural, labour, market and social shocks) are experienced. A more comprehensive and deeper understanding of the vulnerability context is sought in this section, with particular focus on examining the underlying drivers and feedbacks that have produced the observed vulnerability status. Based on field interviews, historical, socio-cultural, economic, political and environmental factors are considered with regards to how they have rendered the food system sensitive and exposed to drought and other shocks that compromise food security. This critical analysis is expected to contribute towards a better understanding of what vulnerability means in the context of resilience.

4.4.1 Historical factors

In the context of the study areas, a number of historical events and processes have shaped the present state of vulnerability. From a range of factors identified, the presence of Mozambican refugees since the 1980s and differences in access to education during the colonial era were found to be some of the most important in agricultural and food systems.

4.4.1.1 Refugees, land degradation and vulnerability

The Mozambican civil war started in 1977, two years after independence from Portugal. The intensification of fighting between the FRELIMO government and the RENAMO rebels intensified in 1986 triggering a large out-flux of people into neighbouring countries, especially Malawi. By the early 1990s, it is estimated that Malawi was home to over a million refugees: with more than one in ten people in 1992 being a Mozambican refugee. While the refugees put a resource strain on one of the poorest African countries in general, Nsanje was the worst affected district. Nsanje had an estimated 220,000 refugees in 1988, outnumbering the local population by over 30,000. Water, health and other public services were severely strained (Rule, 1988).

In the short term, impacts of refugee presence included the sky-rocketing of food prices owing to increased food demand. Furthermore, the debilitation of water and sanitation services under increased population pressure precipitated the outbreak of cholera in Nsanje, with cases reported in 1992;

the same year drought was experienced across southern Africa. Refugee settlement in Nsanje also had longer term implications. Some of the impacts of refugee settlement had long-term consequences for the local population. The settlement of refugees led to large-scale deforestation as trees were used for construction of houses and provision of fuel for cooking. The reduction in the land available for browsing and grazing by livestock is believed to have exacerbated land degradation and soil quality impoverishment. The reduction in grazing area increased cases of livestock grazing crops and related conflicts, and, compounded with other factors such as livestock diseases and stock theft led to a transformation of livelihoods away from livestock keeping, except for poultry. With low livestock stocking rates, respondents have limited stocks to use as buffer against drought. The low stocking rates for larger livestock may partly explain the high dependence on market-sourced chemical fertilisers and poor physical soil characteristics, all of which could have been ameliorated through application of cattle manure. The process through which refugees contributed to contemporary vulnerability to food insecurity is also captured in the following statements from respondents interviewed in Nsanje:

> *"In the past there were many people from Mozambique here because of that war, you know, they were all staying here. So there was nowhere to cultivate. And the government started distributing food for all, those who were coming from Mozambique and even those who were from here because the land owners here had nowhere to cultivate. As a result local people got used to receiving, they are always saying 'give us, give us'. So whenever we are trying to go there with technical advice, they will not actively participate because they are used to receiving free issues. However, little by little they are changing and now the government has stopped giving free issues and we see they are now more willing to learn, some people are now participating.*

> *That mind of free issues is still in their minds (nonetheless)".* Kondwani Theu*, key informant interview, Nsanje
>
> *"Communities did not have a chance to learn to be self-reliant. Refugees were in parts of Nsanje for ten years and being given food by government thus creating a culture of dependence on food aid. Vegetation was destroyed, over cutting of trees to clear land for settlement, and there was no more land for livestock keeping and farming. The district is only starting to rebuild now. Since the syndrome (of donor dependence) had been there for some time, we expect it to take time to go".*Isaac Chimkango*, key informant interview, Nsanje
>
> *"It's because this district was so much loved by NGOs. A small disaster and so many people come with food and everything. So people have lost all means of coping with shocks, now all they do is to sit and wait for the NGOS to come and assist. Maybe before the Mozambican refugees came, there were fewer NGOs".* Patricia Lungu*, key informant interview, Nsanje
>
> *"No one wants to depend on food aid forever. We want to be able to grow our own food. But it is not possible; we have droughts and floods every year. Yes, we still need NGOs here".* Thomas Maundi, key informant interview, Nsanje

In explaining vulnerability to food insecurity key informants asserted that capacity for self-sufficiency had been eroded through high dependence on aid. Kondwani Theu, an agricultural development officer in Nsanje and Isaac Chikango, a village development committee member, both blamed it on the Mozambican refugees. The main argument raised by most respondents suggests that the inclusion of Malawians on the food benefit register to address vulnerability to food insecurity then, given loss of land to refugee settlement, entrenched a culture of dependency on food aid, what most respondents referred bluntly as 'laziness'. The protracted presence of refugees over a decade is believed to have weakened learning in agriculture, hence low level of participation, and robbed people of skills and incentives for producing their own food. During this period, other hazards such as crop

pests, disease outbreaks like the cholera of 1992, droughts and floods, further reinforced the image of Nsanje as a 'vulnerable place'.

Food aid provided by the United Nations High Commission for Refugees (UNHCR) and government of Malawi was in the form of maize, beans and cooking oil, among other things. Some respondents argued that this 'over-exposure' to maize affected the long standing preference for small grained cereals like sorghum, which are also seen as more suited for the dry conditions in Nsanje. A new culture of maize consumption was thus created and even after the programme ended, the majority of people retained maize preference. According to data collected, only 12% of respondents consume sorghum as staple food in Nsanje, compared to 80% for maize. Dependency on maize is embodied in a popular statement in Malawi: "*nsima ndi mwoyo*" meaning "maize is life". In the contemporary case, the culture of maize cultivation and consumption is being reinforced by the government's bias for maize ahead of other traditional food crops such as sorghum and millet in the farm input subsidy programme.

The response by Patricia Lungu, an officer in a humanitarian NGO, highlights the problem of prolonged aid projects, whereby the benefit derived from aid organisations is perceived by recipients as a long term coping strategy, thus denying livelihood systems the opportunity for transformation. In this case, maintaining a state of vulnerability becomes attractive. While respondents like Kondwani felt that this dependence could be reduced by discontinuation of assistance, any measures to address

vulnerability would have to take into account the fact that frequent exposure to droughts and floods had a detrimental capacity on effect on the capacity of recovery from shocks. Thomas Maundi felt that even where transformation to self-sufficiency was desired, the pressures of droughts and floods negated opportunities for escaping this state. As such, the identity of Nsanje as an area where populations are vulnerable to food insecurity has persisted to date. In contrast, Mzimba is referred to as self-sufficient. As captured in the statements above, dependency on NGO and government assistance was seen by agricultural development officers (ADOs) as a deterrent to participating in agricultural capacity development initiatives. According to ADOs, the attitude implied was "why learn to farm when I can get free food".

4.4.1.2 Access to education in colonial Malawi

Attainment of education is an indicator positively associated with a range of wellbeing outcomes such as income, health quality, nutritional status, and access and high likelihood of uptake of technology, including agricultural technology.

Table 4-18: Highest level of education attained by head of household in Nsanje and Mzimba

		Nsanje		Mzimba		
		Extension Planning Area				Total
		Makhanga	Nyachilenda	Manyamula	Vibangalala	
N		51	49	50	44	194
Education attained	None	31.4%	34.7%	34.0%	2.3%	26.3%
	Primary	52.9%	44.9%	60.0%	47.7%	51.5%
	Secondary	15.7%	20.4%	6.0%	50.0%	22.2%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Source: Author, 2011

Table 4-18 shows that EPAs in Mzimba reported higher level of education attainment compared to those in Nsanje, consistent with the 2008 census results which indicate a literacy rate of 75% in Mzimba compared to 52% in Nsanje. Respondents to the study cited a range of causes and effects of the regional variation in education attainment and literacy.

Historical narrations by respondents in Mzimba attribute the differences in education between Mzimba and Nsanje to both the colonial force present in the local area and its objectives or approach. In Mzimba Scottish missionaries such as David Livingstone were hailed as having promoted education attainment, despite the fact that many locals were initially excluded. The educated African was seen as a vehicle for spreading the western civilisation. In the central and parts of the southern region the Dutch Reformed Church of South Africa also provided education. However, they were mistrusted by locals as they were coming from a country where apartheid was being practiced. Unlike the Scottish missionaries, the Dutch approach was to provide minimum education limited for the purpose of communication. Through the influence of western education and religion, locals started and were made to start perceiving their culture, knowledge, beliefs, and practices as inferior. For example, a Scottish meteorologist working in Mzimba gave local communities predictions of rainfall events which appeared perhaps more accurate than they were able to generate through their indigenous climate forecast indicators. Western education, knowledge and culture were perceived to be more civilised than local equivalents. In addition, the

colonial agriculturalists imposed farming practices such as conventional ridge tillage and failure to comply resulted in a fine.

Regardless of the effect of missionary education on African knowledge systems and on agricultural productivity, Mzimba and other districts in the Northern Region had a head start advantage with regards to accessing formal education. The ability to read and speak English was seen as very important in enabling one to access various social and economic opportunities, including employment.

When the Federation of Rhodesia and Nyasaland which brought together the three British colonies, Southern Rhodesia (now Zimbabwe), Northern Rhodesia (Zambia) and Nyasaland (Malawi) was formed in 1953, respond groups argued that the colonial government preferentially favoured Southern Rhodesia leading to the former attaining a higher level of economic and infrastructural development, at the expense of the latter. As reminisced by Mautho and David;

> *"We first heard about tarred roads from those who had travelled to Salisbury (Harare) and it was many years before any (tarmac) was placed in this country".*Mautho Mvula, FGD, Mzimba

> *"Others told us there were stairs in Harare, houses layered on (top of) others. It was difficult to imagine, and so many of our people aspired to go to Zimbabwe so they could see for themselves".* David Tembo, FGD, Mzimba

In addition, labour was moved from Malawi to contribute to farming, mining and manufacturing industries in Southern and Northern Rhodesia upsetting local agricultural labour adequacy, adding on to the damage already inflicted by the Arab slave trade and the First World War (where

Malawi as a British colony enlisted 169,000 soldiers as ammunition and supplies carriers) and exacerbating poverty in Malawi. Since the migrants from Mzimba and other parts of the Northern Region had had better education, some of them managed to obtain training in agriculture in Southern Rhodesia, and on return to Malawi at the end of the federation started tobacco farming and, with the incomes earned, improved the level of human development. In Nsanje, some respondents highlighted that the poorly educated migrant from Nsanje could only do menial jobs in Southern Rhodesia and, on return, could not set up comparable enterprises.

4.4.2 Social and cultural factors

Social and cultural factors influence vulnerability through their effect on shaping attitudes and perceptions, resource access and utilisation. Respondents were asked to identify social and cultural values that enabled their survival in the face of shocks, and those that rendered them vulnerable to shocks such as drought. Interestingly, while the first question did not generate much discussion beyond the African worldview of Ubuntu which emphasises selflessness and empathy for fellow humans, the second sparked livelier debates with a stronger emphasis on certain elements that were perceived as out-dated, irrelevant and un-modern. Counter arguments mainly from older participants provided a space for reflection and critical analysis of the context within which cultural norms and values produce vulnerability.

Cultural norms and value systems have an influence on agricultural land use. One practice that is leading to a high incidence of land clearance in Mzimba is the cultivation of finger millet which is done only on virgin land and used for traditional beer-brewing for social consumption or as a component of various traditional rituals. The following four responses were obtained from the field study:

> *"You see, most of the people in this district (Mzimba) came from South Africa, while the Chewa came from the Congo Basin. So, we are patriarchal, our system is patriarchal where we belong to the father. As, patriarchal we marry using lobola. We pay some cattle to our wives' parents. As such we keep a lot of cattle for that custom and that is why we still have a lot of cattle in this district. But our management is very poor, we don't plant fodder, we don't do that. So this is bringing a lot of land degradation. So you find a lot of gulleys, see animal tracks all over...that's a sign of degradation. I am not Ngoni, but I was brought up in Ngoni society".* Joseph Mumba*, key informant interview, Vibangalala, Mzimba
>
> *"The Ngoni have three things they love: beer, women and meat. So they will prepare local beer from millet, in the Southern region they use maize. Our cultivation of finger millet is many (many) years backward. So every year when someone wants to grow millet they have to clear virgin land, cut down trees, burn them, and where there are a lot of ashes that is where you plant millet. So you find that every year they clear land. That tradition has made this once beautiful district to be very bare".*Daniso Kumwenda*, key informant interview, Manyamula, Mzimba
>
> **Author***: "As an extension officer, are there any cultural barriers that you face in promoting new farming technologies in this community?"*
> **Respondent***: "Maybe in the past. Nowadays people do believe in God so they have forgotten their culture, there are no barriers."*Mautho Mvula*, key informant interview, Mzimba
>
> *"Women do not own land in Mzimba and at death or divorce they return to their homes landless. They are like visitors and do not have much say in meetings. You have got men who are the owners of the village and women who are added on, who are married to the village".* Kennedy Nyirenda*, key informant interview, Mzimba

As demonstrated by the first respondent, the practice of lobola in patriarchal societies such as Mzimba and parts of Nsanje was largely perceived as the main reason for keeping livestock. The number of male children influenced the potential herd size, with each father aspiring to ensure adequate cattle were kept for all his sons. In Mzimba, several respondents argued that this cultural practice was contributing substantially to overgrazing and land degradation. At the same time, there was an admission that increasing poverty levels have, in fact, lowered the bride price thus enabling households to divert some of their animals towards other household financial obligations. Of note is that the respondents did not elaborate on the benefits such as the transfer of wealth to the bride's family which could potentially reduce material poverty and promote some sense of equity. Further, the weakening of this cultural practise was linked to the influence of the Chichewa culture where cattle play a less prominent role. As a consequence of the reduced value of cattle in the cultural system, herd sizes are declining, as is the incidence of certain breeds. Associated with the decline of cattle ownership is the reduced capacity to generate organic fertilisers (manure) which is very important for maintaining good soil physical properties. As a consequence of low stocking rates, households in Mzimba are increasingly dependent on the market for chemical fertilisers that contribute less to the soil's biological properties and physical resilience to agents of erosion.

In Mzimba, respondents also identified a shifting cultivation practice called *visoso* as having caused extensive deforestation and land degradation. This practice involves clearing virgin land and burning the bushes and using the ash to fertilise a finger millet crop. The finger millet is used for brewing local beer which plays an important role in various ceremonies. It appears that this practice may have had less environmental impact a number of decades back when population pressure was lower and land could be allowed adequate time to recover. The majority of respondents in most focus groups appeared unsupportive of this practice, especially on religious or Christian grounds as they do not partake in some of the traditional rituals or ceremonies. Interestingly, the clearing of forests for firewood used in curing tobacco and constructing barns for drying tobacco leaves was brushed under the carpet in these discussions.

The third respondent, Kennedy Nyirenda, identified culture as a barrier to technology uptake by local farmers. The spread of Christianity was seen positively as a mechanism through which local cultural identities and values could be diluted in such a way that locals would be more receptive and less resistant to modern and externally developed superior farming methods. This perception of Christianity as representing modernity, and modern as superior was echoed by staff in NGOs and government departments who argued that in most cases where projects fail to deliver on intended outcomes, it is often the invisible leg of culture that trips development over and stalls progress. In essence, their argument is that culture should conform

to new ideas and projects, rather than new ideas and projects being derived from within the cultural contexts. In a sense, loss of cultural and social resistance to new knowledge is seen as desirable for development, but this is worrying as it implies that agency of communities is undermined, and social ecological systems are exposed to exploitation as they lose their identity and self-determination. Swallowing whole the new technologies without raising a finger makes a mockery of the whole idea of 'participation' and gives communities future problems, by way of new technology, for which they have no institutional memory to assist in analysing or solving issues.

An elderly respondent in Nsanje argued that the decrease in life expectancy had led to absence of elderly community elders who could lead some cultural activities associated with rain making. The respondent argued that droughts were a manifestation of punishment for the displeasure caused to ancestral spirits by social and environmental decay by different social groups. An interview with an elderly respondent in Makhanga in Nsanje highlights the effect of changing demographic structure on cultural practices based on demand- driven rainmaking.

> *"In the past we used to talk to our elders (ancestral spirits). Eh. We used to worship (the ancestral spirits).We would go and say our prayers and the rains would come. Yes. These days it's no longer there. People just sit. They just sit and wait for the rain without asking for it. Now we do not have elderly people to go up and communicate with our ancestors, none at all. There were no droughts then like you have these days. We would ask for the rain and on our way back (from the sacred shrines), it would rain".* John Major, FGD, Nsanje

These views were not, however, given much attention in the community focus group discussions where participants professed limited or no direct association with ancestral spirits especially in as far as drought was concerned. It appears that the lack of belief or interest in indigenous knowledge and practices, in favour of western science, especially among youth and young adults interviewed could be stalling inter-generational transfer of knowledge. For example, two groups of young farmers interviewed informally in Nsanje and Mzimba were not able to identify some of the common indicators of indigenous knowledge-based seasonal climate forecast indicators. Lack of knowledge to deal with environmental and ecological challenges or to take advantage of them weakens adaptive capacity and magnifies the impact of environmental and socio-economic or political changes.

Other cultural practices that were seen as producing vulnerability to food insecurity included those related to governance of resources at household level.

> *"Women do not own land in Mzimba and at death or divorce they return to their homes landless. They are like visitors and do not have much say in meetings. You have got men who are the owners of the village and women who are added on, who are married to the village."* Joseph Mumba*, key informant interview, Mzimba.

In contrast with matrilineal systems, in patriarchal societies land is inherited through the patriarchal lineage. The culture of stripping widows of assets owned by her late spouse was seen as escalating especially in Mzimba. Some respondents argued that while this had become common practice, it was not

traditional. Within the traditional set up, inheritance by the wife ensured that the widow and her children remained within the village with the widow being taken over by her late husband's brother. However, as a result of poverty, HIV/AIDS and emancipation of women, inheritance by wives is increasingly less common and this traditional social protection mechanism has been lost, rendering widows one of the most vulnerable groups.

In Nsanje, practices such as initiation of girls, wife inheritance and sex rituals that are performed to appease the spirits of the dead were identified as increasing vulnerability to HIV/AIDS and exacerbating the likelihood of experiencing its asset crippling and human labour constraining impacts. Widows have to be cleansed through a sexual ritual called *kupita kufa.* A young woman who is caught aborting has to have sex three times with an appointed male, increasingly now hired for cash, to cleanse her and prevent avenging spirits from tormenting the village. Sex with pregnant women is seen as taboo, and therefore men may end up soliciting for sex outside the boundaries of marriage, increasing risks of HIV infection. There was recognition that these practices are less popular now as more people are aware of the associated risks.

The lack of appreciation of the value of local and indigenous knowledge has the effect of exposing the community to external knowledge with minimal interrogation. Such a scenario may lead to uptake or adoption of locally inappropriate practices. Interviews in Nsanje provide one such example

where indigenous belief upholds the existence of a spirit medium that blesses fields and makes them more productive:

> *"Here in Nsanje people believe that there is a spirit medium called Mbona. Before the planting season, Mbona walks across the fields blessing them. But Mbona is now very old and so if you make ridges in your field she won't be able to walk across your field and bless it."*Benito Bemba, FGD, Nsanje

Disregard of this belief was demonstrated through the substantial proportion of households in the flat lowlands of Nsanje who were practicing ridge making. In a normal non-drought year, the ridges would lock in water leading to localised flooding and, consequently, diminished soil nutrient uptake by crops causing low crop yields. In a drought year, ridges were more likely to be effective through increasing soil water retention. According to local agricultural extension officer, more value could have been attained by promoting conservation farming in the water-scarce uplands as opposed to the lowlands where the flood risk is much higher.

In various literature examined, culture is often cited as one of the barriers to technology uptake. While this may be true from the perspective that new knowledge is contested and has to prove its potential for betterment before being accepted, it may be equally true that culture may be blamed for experiences that practitioners fail to explain. For example, low uptake of postharvest practices such as shelling in Mzimba appeared hindered by lack of adequate labour, and in some cases ignorance about alternatives, rather than traditional values.

> *"It's like this, the weeding and harvesting seasons are the peak seasons for ganyu. If you don't have enough food you will have to work on other people's fields in order to get a little something to feed your children. So, there is no time to sit down and shell maize when others are working for their families, for school fees and the like".*Lydia Moyo* Mzimba

4.4.3 Economic factors

The economic drivers of household and community level vulnerability to drought were analysed by focusing on the effect of successive exposure to drought on the household economy, as well as in exploring how some of the common livelihood and coping strategies used were producing and maintaining the social and economic conditions which rendered people vulnerable to food insecurity. In this analysis, the role of government policy was also considered.

4.4.3.1 Effect of climate hazards on poverty

The results from the field study indicate that livelihoods in the study areas are highly undiversified and predominantly dependent on agriculture and natural resources. As shown in **Table 4-19**, a total of 72.3% of households depended on either subsistence or cash crop farming as their main source of livelihood. Other livelihood sources within the study areas, such as ganyu and petty trading, were also linked to agriculture. Non-agricultural income was important for only 7.2% of all respondents, and distributed around formal employment (3.1%); remittances (2.6%) and trades (1.5%).

Table 4-19: Main source of livelihoods in Nsanje and Mzimba

	District		Total
	Nsanje	Mzimba	
N	100	95	195
Subsistence farming	38.0%	34.7%	36.4%
Cash crop farming	35.0%	36.8%	35.9%
Livestock farming	2.0%	9.5%	5.6%
Ganyu	6.0%	5.3%	5.6%
Petty trading	6.0%	1.1%	3.6%
Fishing	6.0%	†	3.1%
Formal employment	3.0%	3.2%	3.1%
Remittances/gifts	2.0%	3.2%	2.6%
Selling firewood	1.0%	3.2%	2.1%
Trades	1.0%	2.1%	1.5%
Timber	†	1.1%	.5%
Total	100.0%	100.0%	100.0%

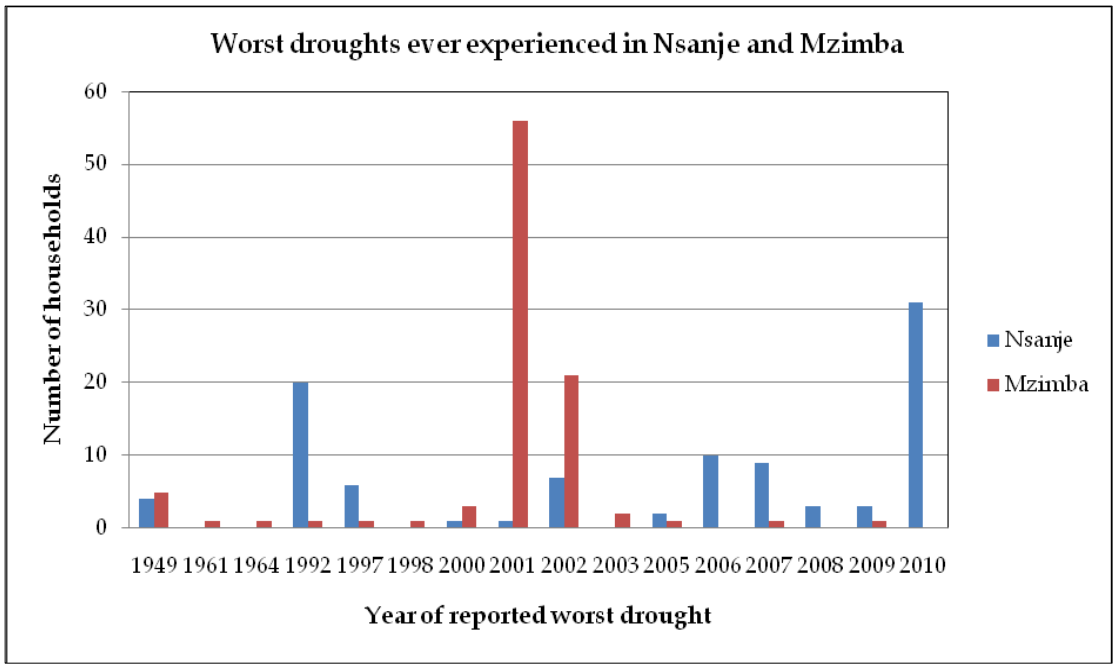
† represents null observations made

Source: Author, 2011

While dependence on agriculture and natural resources did not necessarily imply vulnerability, respondents considered the various episodes of drought and floods as having contributed to their current state of poverty, which rendered them vulnerable to climatic shocks. It was argued in focus group discussions that droughts, spells and floods had increased in recent years, and one consequence of this was loss of assets and increased poverty which made responding to the subsequent shock even more challenging. Households identified their worst drought experience and the frequency is reported in **Figure 4-5**.

Figure 4-5 identifies the years 1992, 2001, 2002 and 2010 as the worst drought years. In Mzimba, most respondents agreed on the years 2001 and 2002 being the worst droughts ever, in Nsanje the worst drought experiences were more

evenly distributed indicating that different households had different socioeconomic circumstances which may have influenced the magnitude of change occurring as a result of drought.



Source: Author, 2011

Figure 4-5: Years of reported worst drought in Nsanje and Mzimba

The following narratives express the relationship between drought and household coping capacity:

> *"The problem is not that droughts have become more frequent, but rather that people have become poorer to an extent that even a small change in rainfall has large impact on harvest as they fail to cope"*. Thomas Major*, FGD, Nsanje

> *"You cannot adapt to drought, because drought is an indication of failure to adapt to a dry spell"*. Sidamiko Mvula*, FGD, Mzimba

> *"Floods are better because their effects are clear to everyone, including government officials. The problem with drought is that one suffers in silence, behind closed doors"*. Waleke Alfred*, key informant interview, Nsanje

Thomas Major, an elderly respondent interviewed in Nsanje attests that the experience of drought occurs where people lack resources to respond to shortfalls in rainfall amount. This view sees vulnerability as a socioeconomic drought and therefore contends that the droughts that have been experienced in the study areas are socioeconomic droughts, rather than purely meteorological. For example, while the 1992 drought was ranked as the worst drought in most southern African countries, in Malawi the impacts were less severe as Banda had managed to secure food stocks from South Africa. In 2001 and 2002, the drought reported in Mzimba was market related, where shortfalls in supply on the market triggered by drought and floods led to skyrocketing prices and demand failure. Respondents argued that in droughts, people suffer in silence and losses suffered are often too high by the time alarms of a drought are raised, given the creeping nature of drought. For example, changes such as children being married off for food and unfavourable terms of trade for various assets were beyond replacement, thereby weakening response capacity. In contrast, floods on the basis of their larger scale of geographical coverage and more visual impact, often attracted immediate attention and had more robust early warning and monitoring systems.

The economic contribution of drought to vulnerability was demonstrated when respondents were asked to state the worst impact felt as a consequence of the worst drought experience. The worst impacts suffered were mostly related to economic loss of various tangible and intangible assets. When the

impacts of the worst drought are considered, it is clear that various categories of assets were lost. The loss of these assets is correlated to increase in poverty on one end, and increase in vulnerability to future food insecurity. **Table 4-20** shows that livestock loss was cited by 43.9% of households as the worst impact of drought. Loss of livestock was associated with diminished draught power for land tillage, especially in Mzimba where land parcels are larger as well as loss of financial assets that could be liquidated to enable purchase of food when faced with various shocks on the farming system.

Other economic losses caused by drought included loss of employment (16.9%) and loss of farm implements like hoes and ploughs (13.8%). Respondents reported instances where they had resorted to selling farm implements and land in exchange for food or cash, or to pay off debt. Such losses meant that even when a good season followed typical drought years, some households lacked the capacity to prepare land in time to take advantage of good yields, and were therefore more vulnerable to food insecurity. 6.9% of respondents reported children dropping out of school in drought years, so they could contribute to food sourcing. Loss of education was associated with limited opportunities for non-agricultural income and its related benefits including remittances, access to hybrid seed and fertiliser, etc.

Table 4-20: Worst impact of worst drought

		District		Total
		Nsanje	Mzimba	
N		98	95	193
Impact of drought	Loss of land	12.5%	1.1%	6.9%
	Loss of livestock	47.9%	39.8%	43.9%
	Loss of farming implements	14.6%	12.9%	13.8%
	Family breakdown	1.0%	6.5%	3.7%
	Children married off for food	0.0%	11.8%	5.8%
	Children dropped out of school	0.0%	14.0%	6.9%
	Death within household	1.0%	3.2%	2.1%
	Loss of employment or income	22.9%	10.8%	16.9%
Total		100.0%	100.0%	100.0%

Source: Author, 2011

Loss of the various critical production assets shown in **Table 4-21** contributes significantly to chronic food insecurity and magnifies the vulnerability of households to drought and other shocks.

Table 4-21 shows that the impacts of droughts were made more intense mainly by factors such as high food prices (79.5%); non-availability of food on the market (64.9%); or the fact that one drought followed another and therefore limited scope for recovery (54.4%); or occurred on the same year or followed disease outbreaks (49%); and floods (25.6%).

Table 4-21: Factors magnifying the impact of drought

Impact Magnifying Factor	**Household Affected (% within factor)**
Followed another drought	54.4
Followed a flood	25.6
No food available on market	64.9
High food prices	79.5
Price and quantity controls	33.0
Outbreak of disease	49.0

Source: Author, 2011

4.4.3.2 The contribution of ganyu to vulnerability

There are few opportunities for income generation outside ganyu in the study areas. In the 12 months prior to the survey, 40.7% of respondents interviewed were engaged in ganyu (**Table 4-22**).

Table 4-22: Household participation in ganyu casual labour provisioning

		District		
		Nsanje	Mzimba	Total
N		99	95	194
Ever did ganyu in last 12months	Yes	39.4%	42.1%	40.7%
	No	60.6%	57.9%	59.3%
Total		100.0%	100.0%	100.0%

Source: Author, 2011

The duration of engagement in ganyu ranged from 1 day in a year to 48 weeks of the 52 weeks in a year. The average rate per day ranged from MWK30 to MWK3000 with the difference in rate being attributed to the nature of the task and level of skill required. Incomes earned similarly ranged from MWK800 to MWK80,000 (Table 4-23). Ganyu was crucial for food consumption smoothing during the period September to March when household food stocks were normally depleted. The proportion of households engaged in ganyu was much lower than typical due to drought which limited demand for ganyu labour.

Table 4-23: Duration of ganyu provisioning

Descriptive Statistics					
	N=155	Minimum	Maximum	Mean	Std. Deviation
Number of ganyu weeks	114	.20	48.00	8.9228	9.36041
Average ganyu rate per day	100	30.00	3000.00	3.0450E2	320.00513
Total received in cash	109	800.00	80000.00	1.5866E4	17932.77075

Source: Author, 2012

On average, households spent almost nine weeks engaged in providing ganyu. However, while this led to a reduction in food stress, as shown in the correlation matrix in **Table 4-24**, where duration of ganyu was negatively correlated with consumption of less preferred food (r=-0.192; p=0.041) and restricted consumption (r=-0.207; p=0.028), the timing of ganyu often coincided with rainfall onset and weeding stages of the farming calendar. This meant that households sold their labour at a critical stage to meet immediate household food requirements at the expense of the new season's yield. By compromising the next harvest (e.g. through delayed planting and reduced weeding frequency), the poorer households were likely to depend on ganyu in the next season.

Table 4-24: Correlation between duration of participation in ganyu and likelihood of food stress

Correlations							
		Number of ganyu weeks	Reduced consumption	Less preferred food	Distress food sourcing	Restricted consumption	Distress food purchases
Number of ganyu weeks	Pearson Correlation	1	-.097	-.192*	-.067	-.207*	.071
	Sig. (2-tailed)		.305	.041	.481	.028	.455
	N	114	113	113	113	113	113
*. Correlation is significant at the 0.05 level (2-tailed).							

Source: Author, 2011

High demand for ganyu often led to weaker rates of payment and therefore longer engagement in ganyu, with the consequences being repeated. This system therefore, trapped households as net labour providers and with a chronic food deficit. The positive and negative outcomes associated with ganyu were captured in focus groups as follows:

> *"If the ganyu was adequate, it could promote peoples' livelihoods. It would allow a household to survive until the next harvest, because the most important thing is to get the cash and buy food. However, there is some exploitation because of the demand and supply issues. There are so many people looking for ganyu and in the process you get exploited. Actually, you don't get the value of your labour".* Kondwani Theu,*, key informant interview, Nsanje

> *"The worse thing is that during the same time you are expected to work in your own garden, you are expected to be weeding, planting and all that. I think that some of your time although not very paid for. People survive, that's what everyone survives on. Good for survival, but difficult to get out of the trap. Had it not been for ganyu, some households would have perished".*David Tembo*, FGD, Mzimba

> *"We would not be here without ganyu. The problem is that the rates are always changing'.*Eliza Solana*, FGD, Nsanje

> *"Even on a good season we may have to do ganyu in order to get money for buying seed and fertiliser and feeding your farm labour. But quite often these days, by the time you get paid, the rains would have gone".* Wisdom Mvula*, FGD, Mzimba

According to Kondwani Theu, the high demand for ganyu as a consequence of limited economic activities and this, in turn, pushes down agricultural wages. To meet demand for food and income, households respond by investing more time to ganyu, a practice which compromises labour availability for their own production systems, but does not reward them well enough to meet their medium term demand. Loss of labour to ganyu was seen as limiting household capability to weed their own fields, shelling maize before storage or even uptake of new technologies especially if the new technologies, even though likely to reduce drought impact, required additional labour beyond that needed in normal practice. Interestingly, in initial responses to why respondents were not shelling maize before storage, a practice which exposes maize to storage pests, the respondents had cited

that leaving maize on the cob was a traditional practice. It appears that while the practice may have been possible but less problematic because of lower pest incidence, the failure to shift to shelling to reduce LGB attack was clearly a labour issue. This means that some of the barriers normally cited as cultural may, in fact, be economic or labour- related.

Ganyu was reported to have been in use since the colonial days when the introduction of the hut tax forced African men to seek employment in the estate farms in order to earn the money from which tax could be paid. In Nsanje, respondents cited ganyu as being used to access land for farming on estates. A labourer was given a small piece of land to cultivate in exchange for his input in the estates. The postcolonial government of Dr. Banda is perceived as having constrained farmers' transition into commercial farming. According to respondents interviewed in Mzimba, Banda wanted people to leave cash crops to estate farms and concentrate on feeding their families. The agricultural policies, such as pricing of agricultural cash crops in the government- run marketing company, ADMARC, were always kept below the prevailing price in order to enable the government to make revenue and keep cash crop farming unattractive to smallholder farmers. Clearly, both the colonial and postcolonial systems sought to ensure labour adequacy for ganyu in estate farms. Contemporary ganyu is an extension of both systems described above; it keeps the labourers away from their own fields and supplying their labour to their richer neighbour.

4.4.4 Environmental factors and geographical location

Environmental characteristics prevailing within different geographical locations had profound effects on the range of hazards to which social groups were exposed. In addition to this, the environment determined the range of economic activities and food sourcing opportunities that could be possible for the local inhabitants. In terms of food security in Nsanje, for example, households located on the 'wrong side of the river' reported exclusion from the food market during the flood season with serious consequences for food security. The effects of floods on food security were captured in the following narratives:

> *"You may have your money, but if you are on the wrong side of the river then we are the same' (Both cannot access food)".*Alinafe Phiri*, FGD, Nsanje
>
> *"These rivers shut us from the rest of the world during the flood season. The 2001 flood was like that".* Lakiyoni Smart*, FGD, Nsanje
>
> "*The roads here are very bad, and even though some small shops have been opened they will eventually close, because transport costs are very high, no one wants to bring their car on such bad roads. Sometimes the roads are so bad that even food aid cannot get to some places".*Esikomu William*, key informant interview, Nsanje
>
> *"In Nyachikadzi they are practically living in water and that's why we are telling them to move from there. Relief agencies have to use canoes to take food to those people. Now the government is saying no more assistance (will be given) to people who refuse to move upland when they are told to do so".* Kondwani Theu*, key informant interview, Nsanje
>
> *"Lowland people have more land than upland, five to six acres of land is possible. Upland areas are mountainous, so less land available for farming and the soils are shallower".*Zocheza Bitoni*, key informant interview, Nsanje
>
> *"It is difficult to move people from the flood-prone areas, where will they farm? Without providing food and livelihoods they enjoy in the flooded area, they will not move".*Patricia Lungu*, key informant interview, Nsanje

> *"I can say in Nyachilenda as a whole, all of them there are affected by floods. As for TA Ndamera, some are affected others not. The same applies to Chimombo, some are affected some are not. But in TA Nyachikadza, the whole TA is affected"*. Isaac Chimkango*, key informant interview, Nsanje.

> *"Cutting down of trees in the uplands contributes to increased risk of flooding in the lowlands. This is because, as you saw, all the rivers are full of sand. This is because there is no good level of development in the uplands. However, this exploitation is for supporting livelihoods, because people clear forests to plant maize, actually making the land more vulnerable, while others burn wood to make charcoal for sale. All these things have negative impact on environment. The main culprits are in Blantyre and Mulanje"*.Charlie Banda*, key informant interview, Nsanje

> *"As I have said earlier on, whenever we hear of floods others do suffer while others become happier. If floods come, others move down in order to cultivate and get more food. When we have a drought in the upland, it is very difficult to recover compared to the marshes"*. Samaria John*, FGD, Nsanje

The narratives by Alinafe Phiri and Lakiyoni Smart suggest that food access is not only dependent on the financial capacity to demand food, but rather is influenced by the location of the consumer relative to the food source. Thus, where infrastructure such as roads and bridges are not robust enough to cope with hazards, people may be excluded from the food system and rendered vulnerable to food insecurity. Esikomu's comments indicate that beyond proximity and accessibility of food sources, the systems within the food chain should be engineered such that hazard impact on food availability and prices are minimised.

It also emerged from the focus groups and interviews that while floods had a wide geographical coverage, there were differences in the level of impact felt at household level. Households with access to flood plains may benefit from flooding through flood recession irrigation, growing crops such as rice,

sweet potatoes, and beans, and thus have better capacity to cope with other shocks such as drought. While households with limited land access may have more opportunities from irrigation related ganyu, their lack of houses in the uplands implies that they suffer more asset loss than their richer neighbours who often have a second house on the uplands. The upland based households lamented loss of soil, fertilisers and seed to floods; while the lowland respondents boasted at not having any need to apply fertiliser as the floods brings nutrients to their fields. **Figure 4-6** shows the author at the site of a field prepared in the flood plains to harvest flood water for irrigation.

Source: Author, 2010

Figure 4-6: Fields with bunds for holding flood water to facilitate irrigation in Makhanga, Nsanje

Households with access to floods appear to have higher capacity to recover from droughts. This benefit from crisis explains the resistance to move from the flooded areas, as upland mobility has so far not allowed for continuation of benefit (emergency relief and flood recession irrigation). One village that

had moved to the uplands was asked to settle in another traditional authority and housed within a camp. The respondents lamented inaccessibility of fields in the uplands as a huge cost of moving as directed. The disaster risk reduction approach to adaptation in Nsanje appears to focus on reducing and protecting the at risk populations, based on identification of the most at risk locations. However, on the basis that when one's house is affected by floods and they are labelled vulnerable they may benefit from relief organisations (which are not usually there to see people using flood recession irrigation later in the year), the identity of being vulnerable is fast emerging as attractive thereby demotivating individuals from self-protection from floods. **Figure 4-7** (Author, 2010) exemplifies the 'self-inflicted vulnerability' by showing one of the houses believed to have been deliberately built next to Ruo River for the purpose of enlisting for donor relief packs.

Source: Author, 2010

Figure 4-7: A house built too close to River Ruo may intentionally expose its occupants to flooding

The contrasting geographical locations of Nsanje and Mzimba have an influence on the perceived likelihood of climate related hazard occurrence. The following narratives exemplify this:

> *"Nsanje lies in the disaster prone areas. Give people relief, and when you go there is another disaster, they lose what you gave them, which means you have to come again'.*Charlie Banda*, key informant interview, Nsanje

> *"Yes, we do get droughts here but it's not like what you saw in Nsanje. What we experience here are mostly dry spells".* Joseph Mumba*, key informant interview, Mzimba

Charlie Banda, a disaster risk reduction project officer with an NGO in Nsanje identified the district as disaster prone, which makes it possible for local people to recover and accumulate assets such that they can survive without external help. As Charlie's response shows, relief aid is an insufficient solution as it only temporarily protect people without creating an enabling environment for them to learn from experience, innovate, transform and deal better with shocks and surprises even in the absence of external actors.

With regards to geographical location and exposure to climate related hazards, Nsanje is located at an altitude of 60 metres above sea level and within the Lower Shire valley, at the mouth of major rivers Shire, Ruo and Mwanza. In contrast, Mzimba is located in the highlands at 2000 metres above sea level and the cool temperatures and occurrence of orographic rainfall increase soil water availability and agricultural potential of the area.

The location of both districts close to the border (with Mozambique for Nsanje, and Zambia and Tanzania for Mzimba) also has implications for

vulnerability. In Nsanje, as discussed earlier, proximity to Mozambique offers local residents opportunities for casual labour through which food may be obtained in a drought year. However, Mozambique has been a source of vulnerability in Nsanje, initially through refugees who are blamed for causing deforestation and land degradation, and now linked to cattle rustling syndicates that are impacting both social and ecological resilience through reduction of stocking rates. In Mzimba, Tanzania is believed to be the main source of a recent and more virulent strain of the Larger Grain Borer (LGB). The LGB entered Malawi from Tanzania through cross-border maize movement. Other diseases such as Newcastle which decimated chicken in Nsanje in 2009 and 2010 and swine fever which led to massive losses of pigs in Mzimba are believed to have originated from Mozambique and Tanzania. Zambia has benefited farmers in Mzimba through informal training in ganyu on soil moisture conservation techniques for mitigating drought effects. Clearly, building resilient agricultural systems requires building capacity for managing cross-border and within country diseases and grain movements, although such approaches may on the other hand, affect the effectiveness of informal systems through which even the poor households may secure livelihoods.

4.5 Summary and Conclusion

This chapter sought to describe the vulnerability context in the study areas and analyse the determinant factors. The experience of food insecurity at the

household level was used as a proxy indicator for vulnerability. Evidence gathered from fieldwork was used to contribute to an understanding of the linkage between the concepts of vulnerability and resilience.

The state of household food security was significantly different between the two study areas, Nsanje and Mzimba. Considering the 2009/2010 consumption year and the long term local experiences, Nsanje was identified as the most food insecure of the two districts based on an assessment of food availability, accessibility of sufficient food and reliance on food stress coping strategies. While droughts and floods were important factors in producing food insecurity in Nsanje, Mzimba was more exposed to market shocks owing to weak market integration in the Northern region which exposes locals to market price fluctuations. It is noteworthy that the majority of respondents were net food purchasers, and therefore factors limiting access were of paramount importance to them.

The results of the study illustrate that vulnerability is a complex and dynamic state and outcomes are produced by the interaction of a number of factors, processes and systems. In Nsanje, for example, the study demonstrated that vulnerability to food insecurity was a product of historical, political, environmental, cultural and socio-economic factors. Vulnerability to drought-induced food insecurity was found to vary within districts owing to household specific circumstances such as access to material resources, including land and labour. The results also showed that experience of drought and floods often led to an increase in poverty due to

use of distress coping strategies. Resource poverty produced by one drought increased vulnerability to the next shock. Some losses, such as seed loss, had implications on the pace of recovery after the shock. Similarly, loss of farming implements rendered farmers vulnerable even in a very good farming season.

The results further demonstrated that the impacts of droughts were related to the ability of households to deal successfully with other 'shocks' such as floods. Households with access to flood plains in Nsanje were able to grow crops all year round and therefore occurrence of flooding led to better capacity to cope with drought. However, it was also clear that because different social groups pursue different short term goals, factors that produce vulnerability in the long term are likely to be promoted. An example was that of river bed irrigation which, while supported by ADOs as an agricultural productivity raising strategy, benefited a few community members in the short term but presented long term consequences for vulnerability to flooding at community level due to siltation of rivers.

The results of the study indicate that some locations, by virtue of their biophysical characteristics, will have limited opportunities for enabling sustainable livelihoods. Nsanje was shown to be located in a flood and drought prone area. However, an examination of the processes and events occurring within Nsanje revealed that the conditions that render these places 'vulnerable' are to a large extent human-driven. In Nsanje, for example, large scale deforestation, stream bank cultivation and overgrazing of livestock

may explain the high incidence of flooding, and some of the dry spells and droughts which, according to local respondents, are due to disruption of local hydrological cycles.

Cutter et al. (2008) argue that the degree of vulnerability to hazards is not only dependent on the proximity to the threat, or the physical nature of the hazard, but rather it is the social conditions that are very critical in determining vulnerability. They suggest that most biophysically vulnerable places do not always intersect with the most vulnerable populations. The results of the current study agree in part with this conclusion. While in the hazards literature some locations may be viewed as biophysically vulnerable, in socio-ecological research vulnerability appears to make sense when analysed by asking the question, "vulnerability of what to what". In this case, it is inadequate to describe a location as vulnerable on the basis of its characteristics without specifying the component of the system that is exposed, and the nature of the hazard as well as the impact on an outcome of interest. While it may be tempting to classify Nsanje as a vulnerable place, from the hazards perspective, it is clear that the different experiences of drought or dry spells, and different outcomes in a flood year imply that it is the social conditions that determine who and what is vulnerable, rather than the location. In fact, people living within the flood plains were found to have higher levels of food security than those living further away from the 'vulnerable place'.

While Mzimba may be seen as less exposed to climatic stresses, the impact of the 2001 and 2005 droughts was substantial but produced through the market, rather than in terms of production. Thus, while one location may have less biophysical vulnerability, other aspects of the food system, such as markets, may be more exposed. The results of the study also show that livelihoods are likely to be oriented around the prevailing hazards. The use of flood water for irrigation in Nsanje followed years of suffering the impacts of floods, and can be seen as a positive transformation in the face of adversity. If 'shocks' become frequent, it is their absence that is the 'shock'. In Nsanje, the evidence presented showed that absence of floods led to high levels of food insecurity and failure to deal successfully with droughts. In approaching floods and droughts, it is therefore important to evaluate whether indeed these are hazards or are "normal", and devise policies accordingly.

4.5.1 The short and long term drivers of vulnerability

Wilhite et al. (2007:765) argue that the processes that shape vulnerability are dynamic in response to economic, social and environmental features in a given locale or region. When the study areas are considered, it is clear that some historical processes and events, such as refugees in Nsanje who fuelled deforestation and land degradation, and the differential access and quality of colonial education, are important in having shaped the current state of vulnerability. Emerging from this analysis is that some policy measures that

were put in place to deal with vulnerability in the past, e.g. feeding locals in refugee camps to reduce vulnerability to food insecurity, failed to deal with the underlying causes of vulnerability, and only sought to manage the symptoms.

Previous work e.g. Bunce et al. (2010) has focused on how some policies may increase vulnerability and erode resilience in socio-ecological systems. In the case of Nsanje, it appears that food aid, and indeed dependence on external resources to avert a catastrophic event in general, contributed to a collapse of the production system, weakening learning capacity and loss of power to transform. Dependence on donor aid in Nsanje affected different aspects of society, including identity and self-determination. When people start to see themselves as "vulnerable", and when "being vulnerable" is associated with better survival capacity through food hand-outs, then the state of being 'vulnerable' becomes attractive. Aid dependent people want the 'state of vulnerability' to persist thus rendering such a system difficult to transform towards self-sufficiency, or other similar goals. Prolonged aid was seen by some respondents as having allowed time for such 'vulnerable groups' to continuously reorganise their situation so as to retain the same identity of "being vulnerable", despite developmental measures, so as to remain attractive for donor support. The identity of certain communities as being vulnerable was being propped up by NGOs. According to NGO key informants, donor funding was easier to justify if extent of vulnerability could be portrayed- the higher the level of vulnerability reported, the higher

chances of funding success. On realisation that relief aid was focused on vulnerable places, some households moved closer to the flood exposed locations. Since donors had little knowledge of what happened after the floods, i.e. irrigation following flood recession, these individuals became more strategically placed: receiving relief aid on one hand and irrigating on flood plains on the other. The poor and landless, however, were the losers as they lacked land and had to stay and provide labour, or be viewed negatively by others if they so decided to 'leave their forefathers' graves'. In Mzimba, promoting soya bean production as a way of assisting farmers earn better incomes from agriculture also addressed a symptom, but not the underlying cause. The example showed that lack of knowhow compounded by weak market infrastructure led to failure of the project.

The examples discussed show that current vulnerability is a product of unaddressed or inappropriately addressed vulnerability in the past. As well, it was clear that they are some processes that produced vulnerability in the past that are still present today, but in different formats. The provision of ganyu in estates kept male labour away from home production during the colonial system. Today, ganyu provisioning to richer neighbours produces the same effect. Engagement in ganyu was identified as one system in which people are trapped in low productivity and insecurity, but have illusions of benefit, and also suffer from the indirect long term consequences. In other words, ganyu is a highly resilient labour market system that has evolved and transformed itself over time, and continues to disadvantage the poor,

maintaining them as net food buyers. If ganyu as a resilient system is undesirable, then building resilience will require reducing the resilience of ganyu as a practice through finding opportunities within these cycles to transform and escape the trap.

4.5.2 Relating vulnerability, adaptive capacity and resilience

Miller et al. (2010) and Nelson et al. (2009) argue that the relationship between vulnerability, adaptive capacity and resilience is central to understanding how people deal with changes, disturbances and surprises. Other scholars (Cutter et al. (2008) and Gallopin (2006) have attempted to show how these three concepts could be related to each other from different disciplinary perspectives. Contributing to this was an important part of this study. The results from the study suggest that while the link is often problematic to establish, it is nonetheless very important to understand both the proximate and the underlying drivers of vulnerability if one is concerned with knowing the factors that shape resilience from the perspective of the system and the stressors.

Based on the findings of the current study, an approach that could enable building of a system based on understanding vulnerability would have to be rooted in an analysis of the processes or systems that are resilient in an 'undesirable' way, as well as finding ways within those systems for escaping the traps that keep people in a state where they have low response capacity.

In other words, to promote positive forms of resilience which enables higher response capacity in the face of disturbance, there is a need to understand the entire system and identify, within that system, the undesirable forms of resilience (or undesirable resiliences) which could impede the system from being responsive. By addressing these undesirable forms of resilience essentially what is achieved is that the vulnerability of a system is reduced, and its capacity to respond to shocks is increased. The following chapter focuses on the factors that determine capacity to respond to drought.

4.5.3 Relationship between social and ecological resilience

The link between social and ecological resilience has been investigated by Adger (2000) where he questions whether resilient ecosystems enable resilient communities. While his work focuses on institutional resilience in the management of ecosystems, the current study looks at the cultural aspects. The results from the study show that there is a link between cultural and ecological resilience particularly in relation to agriculture and food security. The loss of some cultural and traditional practices, values, beliefs and knowledge demonstrated in the study areas is indicative of loss of cultural resilience as social groups fail to adequately interpret tradition and fail to learn and transform social institutions and habits in response to social and environmental changes. They also lack the agency to resist and evaluate new knowledge, norms and values. Diminished cultural resilience was shown to result in loss of ecological resilience. For example, the weakening

culture of *lobola* in Mzimba led to increased inorganic fertiliser dependence due to lack of manure source, and because of non-application due to high costs, the physical resilience of the soil has been compromised. Depending on the market for fertilisers, and hybrid seed (instead of local seed that can be saved) was shown to expose farmers to market shocks, thereby increasing risk of food insecurity. In Mzimba, the loss of indigenous knowledge relating to seasonal climate forecasts based on observing vegetation, and the widespread disregard of traditional beliefs (where some trees were viewed as sacred and not to be harvested), led to massive disregard of 'seasonal climate indicators.' This contributed to the failure to interpret the environment and environmental changes. The consequences in Mzimba included loss of livestock, in Nsanje, large scale deforestation including removal of endangered species had` fuelled land degradation and siltation of rivers causing flooding. In both cases, loss of cultural resilience drove loss of ecological resilience, which in turn led to loss of food system resilience.

It was also clear that there are some elements of the cultural system that are highly resilient and highly undesirable. These cultural practices are seen as contributing to vulnerability to food insecurity, and they include the land tenure system in which land is subdivided with each subsequent generation leading to decline in economic potential of agriculture. One challenge encountered in investigating the contribution of culture to resilience was the static view of tradition and culture among respondents. In practice, basing practices on a romanticised view of how 'our elders used to do it' is likely to

minimise space for adaptability, learning and transformation in line with changing circumstances.

Chapter Five

The Effect of Livelihood Assets on Household Resilience

5.1 Introduction

The results presented in Chapter Four showed that vulnerability is not homogenous across social groups exposed to similar hazards. It was argued that social and economic conditions within the community, particularly at the scale of the household, may be very important in explaining differences in the extent of vulnerability. This chapter investigates the contribution of livelihood assets at the household level to food system resilience in response to drought and other stressors. In doing so it responds directly to the second main objective of this thesis as outlined in Chapter One. Specific attention is paid to the context within which livelihood assets produce or undermine the ability of a household to resist, recover and learn from, as well as transform and cope successfully with drought and other stressors. This chapter is organised around the six asset classes (financial, physical, natural, social, human and cultural) as depicted in the schematic model presented in Chapter Two.

5.2 Financial assets

Financial assets considered in the current study included cash or cash equivalent income and household access to savings, credit and regular cash transfers such as remittances from family members. Income from ganyu and ownership of livestock were considered as measures of financial assets in the study areas.

5.2.1 Household participation in ganyu

Casual labour or ganyu was mainly sourced in agriculture but included other non-farm tasks such as digging or building latrines, brick moulding and building, fetching firewood or water, or processing crop or livestock products. Agricultural ganyu in the study areas was seasonal with daily rates and aggregate demand for labourers being dependent on season quality. In other words, opportunities for ganyu were diminished in drought years. **Table 5-1** shows that 59.3% of respondents were employed in ganyu, a proportion seen as lower than usual as a consequence of the drought experienced in the 2009/2010 agricultural season which reduced demand for labourers.

Table 5-1: Household employment in ganyu in 2009/2010 season

			Did you provide ganyu to anyone in the 2009/2010 farming season?		
		N	Yes	No	Total
District	Nsanje	99	60.6%	39.4%	100.0%
	Mzimba	95	57.9%	42.1%	100.0%
Total		194	59.3%	40.7%	100.0%

Source: Author, 2011

The total duration of engagement in ganyu varied from 2 days to 48 weeks (**Table 5-2**). On average, respondents were employed in ganyu for about 9 weeks within the 12 month period prior to the field study. Demand for ganyu was high for the period September to April, coinciding with the main rainfall season and requirement for agricultural labour for land preparation, weeding and harvesting. Importantly, this period was also marked by high food stress in most households, forcing them to sell their labour to earn an income for purchasing food. Oversupply of labour, however, tended to bring down the daily rate thereby necessitating longer commitments to ganyu in order to meet household food demand. Respondents reported that peaks of ganyu demand matched critical farm production phases such as weeding and harvesting. By providing labour at this point of the season, the majority of households engaged in ganyu forwent the opportunity of working on their own fields in their pursuit of short term food consumption and income goals. Delayed planting and reduced weeding frequency typically reduced crop yields for most labour-constrained households dependent on ganyu.

Income earned from ganyu averaged MWK304 (£1.21) per day, ranging from a minimum of MWK30 (£0.12) to a maximum of MWK3000 (£12) per day depending on skill required and nature of task. Total income for the season was highly uneven, from a minimum of MWK800 (£3.20) to a maximum of MWK80000 (£320). The total household income earned from ganyu was dependent on the capability to do physical work, with male labourers

performing more work and earning higher incomes, as well as the ability to cycle over long distances in search of ganyu employment.

Total household income from ganyu averaged MWK15865 (£63.46) for the period in question. **Table 5-2** is a statistical description of ganyu-related variables: duration, rate and total income earned. In all cases the range between the minimum and maximum values was very large, reflecting the differences in household level socioeconomic conditions and capability of engaging in ganyu.

Table 5-2: Household participation and income from ganyu

	Statistics		
	Duration (weeks)	Rate of pay (MWK/day)	Total income (MWK)
N	114	100	109
Mean	8.9	304.5	15865.96
Std. Error of Mean	.87668	32.0	1717.65
Median	5.5	200.0	8400.0
Minimum	.20	30.0	800.0
Maximum	48.0	3000.0	80000.0

Source: Author, 2012

5.2.1.1 Effect of ganyu on household income and food security

The effect of ganyu on household income and food security as well as how employment in ganyu affected household use of agricultural management practices perceived to be consistent with resilient farming systems was evaluated. A correlation test between duration of employment in ganyu and experience of food stress indicated a negative and statistically significant correlation at the 95% confidence interval. The test was based on the five

indicators of food stress identified in the study areas. Results presented in **Table 5-3** indicate that (1) increasing duration under ganyu was associated with a reduction in the risk of consuming less preferred food (r=-0.192; p=0.041) or restricted consumption (r=-0.207; 0.028). (2) In spite of the low strength of the relationship, the results indicate that ganyu may be a viable short term food stress coping strategy as supported by qualitative interviews described in Chapter 4.

Table 5-3: Correlation between duration of engagement in ganyu and food stress experience

			Indicators of food stress				
			Reduced consumption	Less preferred food	Distress food sourcing	Restricted consumption	Distress food purchases
Number of ganyu weeks	Pearson Correlation	1	-.097	-.192	-.067	-.207	.071
	Sig. (2-tailed)		.305	.041*	.481	.028*	.455
	N	114	113	113	113	113	113

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Author, 2012

5.2.1.2 The effect of ganyu on utilisation of drought management practices

Pearson Chi-square tests were used to compare the percentages of households within different categories of employment in ganyu in terms of use of drought management practices. **Table 5-4** depicts a general trend in which use of the various management practices decreased with increasing duration of ganyu employment.

Table 5 -4: Percentage of farmers using drought management techniques within different duration of ganyu employment

		Duration of employment in ganyu (weeks)						
Drought management	**N**	**0.1-5**	**5.1-10**	**10.1-20**	**20.1+**	**Chi**	**df**	**P-value**
Conservation farming	114	64.9%	39.1%	43.5%	36.4%	7.07	3	0.07
Improved food storage	114	21.1%	21.7%	13.0%	0.0%	3.427	3	0.33
Legume incorporation	114	50.9%	39.1%	60.9%	18.2%	6.348	3	0.10
Agro-forestry	114	71.9%	56.5%	39.1%	36.4%	10.062	3	0.02*
Winter ploughing	114	57.9%	47.8%	47.8%	36.4%	2.189	3	0.53
Crop rotation	114	70.2%	56.5%	56.5%	45.5%	3.487	3	0.32
Drought- tolerant crops	114	92.7%	78.3%	73.9%	72.7%	6.438	3	0.09
Drought- tolerant varieties	114	72.7%	82.6%	86.2%	81.8%	2.209	3	0.53

Source: Author, 2012

Table 5-4 shows that management practices that were perceived as being particularly labour demanding, such as agro-forestry, conservation farming and production of drought tolerant crops (sorghum and millet are perceived to have high labour requirements in terms of managing qualia birds and processing harvested sorghum) were less used by households as duration in ganyu employment increased.

In contrast, management practices that were often conducted prior to or following the main farming season, such as winter ploughing, improved food storage mechanisms, and legume incorporation showed weaker differences with varying durations of ganyu employment. The lack of difference for options such as use of drought tolerant varieties and crop rotation shows that where drought management practices were a small diversion from conventional practice, the effect of ganyu was insignificant.

5.2.2 Access to credit, savings and regular cash transfers

The demand for credit and likelihood of obtaining it was very low especially in Mzimba. **Table 5-5** shows that 19.3% of households sought credit from multiple sources. The success rate of securing a loan was 48.7%.

Table 5-5: Percentage of households accessing credit, savings and remittances

	Nsanje	Mzimba	Total
N	98	89	187
Loan applications	18.4%	20.2%	19.3%
Loan success rate	61.1%	38.1%	48.7%
Savings account	6%	11.6%	8.7%
Remittances received	18%	31.6%	24.6%

Source: Author, 2012

The high success rate in securing loans in Nsanje was attributed to the less stringent requirements and accessibility of lenders. 61.6% of respondents who received credit in Nsanje obtained it from an informal source, either a neighbour or an informal money lender. In contrast, while relatives were equally as important in Mzimba as in Nsanje, formal sources such as microfinance institutions, banks and NGO schemes were relatively more important in Mzimba. The high demand for operational finance associated with tobacco farming may explain the interest of formal institutions in Mzimba. **Table 5-6** shows the main sources of finance in the two study areas.

Table 5-6: Sources of credit used in 2009/2010 in Nsanje and Mzimba

	Source of credit						
	Relative/ neighbour	Informal money lender	NGO scheme	Bank	Micro-finance institution	Other	Total
Nsanje n=16	31.3%	31.3%	0.0%	6.3%	6.3%	25.0%	100.0%
Mzimba n=21	42.9%	4.8%	4.8%	19.0%	23.8%	4.8%	100.0%
Total N=37	37.8%	16.2%	2.7%	13.5%	16.2	13.5%	100.0%

Source: Author, 2012

While informal sources of finance were more accessible, respondents cited cases where the interest rates charged were exorbitant, often trapping those seeking finance in debt. Outcomes such as confiscation of land or productive assets which exacerbated the problem at household level were reported. Wealthier households were more likely to access finance from formal institutions than poorer households.

To evaluate the contribution of credit to household response to drought and other stresses, respondents were asked to state the purpose for which loans were sought. The results shown in **Table 5-7** indicate that loans were used primarily for purchasing agricultural inputs in Mzimba (61.9%) and starting small businesses in Nsanje (56.3%). In these cases, loans played a role in intensifying production or diversifying livelihoods, respectively.

Table 5-07: Main purpose for which loan or credit was intended

		Use of credit or loan				
	N	Food and general consumption	Agricultural inputs	Starting a small business	Payment for hired labour	Total
Nsanje	16	31.3%	6.3%	56.3%	6.3%	100.0%
Mzimba	21	9.5%	61.9%	28.6%	‡	100.0%
Total	37	18.9%	37.8%	40.5%	2.7%	100.0%

Source: Author, 2012

The main purpose for which loans and credit were obtained was substantially different between the two study areas. In Nsanje, loans and credit were used primarily for livelihood diversification through establishment of small business (56.3%) while in Mzimba the main purpose was to intensify production through purchase of agricultural inputs (61.9%)

such as seed and fertiliser for tobacco farming. 31.3% of households that sought loans in Nsanje used the money to meet household food and non-food consumption. 28.6% in Mzimba required a loan for starting a small business such as bicycle hire, selling used or low budget clothing, household consumables or farm inputs. Returns from petty trade were reported as low, and for most of the businesses any income generated was used to meet short term demand for food, thereby limiting both debt servicing capacity and business liquidity. In addition to the above, loans were also used in Nsanje by 6.3% of households to pay casual labourers. No case was recorded in the same category in Mzimba.

A minority (8.7%) of all households had at least one savings account. Key informants pointed at the absence of a culture of saving as one of the reasons for this, while communities often indicated that given their incomes and general life circumstances, savings accounts were not of much value to them. In Mzimba keeping livestock instead of cash was locally viewed as a more preferable option for maintaining life savings. This preference was based on the observation by respondents that cash was *too* liquid to keep in a context where shocks are frequent, compared to livestock which took time to sell thereby reducing overall chances of spending money with every small problem that arose. Ownership of a savings account was calculated to be significantly higher for households where the head of household had received primary or higher education, than for those with none (X^2=5.997;

df=2; p=0.05). Informal savings club at village level were also identified as important sources of finances. These are discussed under social assets.

Remittances were seen as an important source of income for a significant proportion of households. 24.6% of all respondents (**Table 5-5**) reported having at least one member who had migrated to a rural, urban or international destination for the purpose of supporting their livelihood. However, there were marked differences in the frequency, amount and predictability of remittance flows with some respondents reporting non-receipt of remittances for over five years.

5.2.3 Livestock as financial assets

Livestock are culturally viewed as a symbol of wealth and a source of power and influence. As such they are considered financial assets as they can be liquidated to generate cash so as to enable a household to deal with a range of needs and cope with stressors. Livestock ownership across all livestock classes was highly skewed as implied by the large range and median values of zero (with the exception of poultry) as shown in **Table 5-8.** The distribution of livestock shows that a high proportion had none and only a few individuals owned some, suggesting that very few people fell between these extremes.

Table 5-8: Livestock ownership

Livestock class	N	% owning	Minimum	Maximum	Median	Mean	Std. Deviation
Cattle	195	11.8	0.00	32.00	0.00	0.7744	3.63
Goats	195	26.2	0.00	36.00	0.00	1.1436	3.34
Pigs	195	11.8	0.00	17.00	0.00	0.5641	2.09
Chickens	195	59.0	0.00	50.00	3.00	5.0974	7.40

Source: Author, 2012

The proportion of households owning livestock was found to be very low in the study areas. 11.8% of households owned cattle and the average ownership was 1 cow for every 5 households (or 0.8 per household). Goats were the most common livestock class, owned by 26.2% of all households with an average ownership of one per household. Pigs were owned in much lesser numbers and, although the total number of household with at least one pig was the same as that for cattle (11.8%), the mean pig ownership was much lower at 0.56 per household with the largest ownership per individual household being 17 pigs.

Chickens were also included in the analysis given their important dietary and income contribution. 50.9% of all households owned at least one chicken with average ownership being 5 birds per household. Different livestock were liquidated to meet a range of household needs (**Table 5-9**). This depended on household asset ownership, experiences and impacts of shock and social rules governing the use of livestock.

Table 5-9: Reasons for selling livestock

	Cattle	Goats	Pigs	Chickens
N	7	26	11	62
Buy food	28.6%	46.2%	36.4%	35.5%
Non- food items and services	57.1%	34.6%	45.5%	45.2%
Pay school fees	14.3%	7.7%	9.1%	6.5%
Healthcare costs	†	3.8%	†	6.5%
Payment for social event	†	3.8%	†	3.2%
Purchase agricultural inputs	†	3.8%	9.1%	3.2%
Total	100%	100%	100%	100%

† No case recorded Source: Author, 2012

Table 5-9 shows that livestock were sold primarily to purchase food (35.5%) and non-food items, including soap and firewood (45.2%). The decision to sell a particular livestock unit depended on the range of livestock owned and cash requirement. For payment of school fees, cattle played the most prominent role, accounting for 14.3% of all reasons for selling cattle. Based on the study sample, none of the respondents sold cattle particularly for the purchase of agricultural inputs or for payment for health or social events. Goats and chickens had the widest diversity of use of all livestock classes. Chickens, for example, were used as payment for ganyu or transportation, barter-traded for grain or used as a form of payment for maize processing at the grinding mill.

5.2.4 Household socio-economic status

Using four socio-economic categories, **Table 5-10** shows that the majority of respondents were classified as poor with Nsanje having a significantly higher percentage of 73% compared to 60% in Mzimba. However, households of moderate socio-economic wealth were relatively fewer compared to the poor groups, especially in Nsanje (12%). Most of the financial assets were concentrated around a minority socioeconomic group

comprising 15% and 12.6% of the sampled population in Nsanje and Mzimba respectively.

Table 5-10: Classification of respondents by socioeconomic status

	N	Rating on level of wealth				Comparison		
		Chronically Poor	Transiently Poor	Moderate	Better Off	Chi-square	DF	P value
Nsanje	100	41%	32%	12%	15%	8.743	3	0.033*
Mzimba	95	27.4%	32.6%	27.4%	12.6%			
Total	195	34.4%	32.3%	19.5%	13.8%			

Source: Author, 2012

Table 5-11 shows that utilisation of drought risk-reducing and other improved agronomic practice was significantly different in five of the ten management practices across the four socioeconomic groups. For farming practices such as fodder production, agro-forestry, winter ploughing, and crop rotation, the highest proportions within social groups were in the moderate category and the transiently poor. Use of management practices such as conservation tillage, water harvesting, and reliance on seasonal forecasts did not appear significantly different across the four socio-economic groups. The expectation was that poorer households would have less use of these practices due to resource constraints. However, because the technologies were targeted at the poor, the income effect was rendered invalid as a determinant of technology use. Drought tolerant crops and varieties were clearly used more within the higher socioeconomic categories.

Table 5-11: Proportion within social groups using drought and general crop management practices

Management Practice	N	Chronic poor	Transient poor	Moderate	Better off	Chi sq.	DF	P value
Conservation tillage	195	43.3%	60.3%	57.9%	55.6%	4.325	3	0.228
Improved food storage	193	14.9%	17.5%	10.5%	8.0%	1.804	3	0.614
Legume incorporation	195	52.2%	46.0%	47.4%	29.6%	3.988	3	0.263
Fodder production	195	25.4%	46.0%	50.0%	37.0%	8.535	3	0.036*
Water harvesting	194	28.4%	22.6%	26.3%	25.9%	0.571	3	0.903
Agro-forestry	195	47.8%	61.9%	76.3%	37.0%	13.056	3	0.005**
Winter ploughing	194	38.8%	55.6%	65.8%	30.8%	11.597	3	0.009**
Crop rotation	195	43.3%	71.4%	78.9%	66.7%	17.297	3	0.001**
Compost manure use	195	49.3%	57.1%	60.5%	40.7%	3.301	3	0.348
Treatment of stover	195	34.3%	23.8%	36.8%	22.2%	3.383	3	0.336
Drought tolerant crops	191	71.9%	85.5%	92.1%	96.3%	11.852	3	0.008**
Seasonal forecasts	191	62.5%	75.8%	76.3%	63.0%	4.028	3	0.258

* Statistically significant at 95% confidence interval (p≤0.05); ** statistically significant at 99% confidence interval (p≤0.001)

Source: Author, 2012

Use of the various drought management and crop improvement strategies was generally higher among households in the moderate socio-economic class. This finding suggests a possible higher motivation and capability for technology uptake among the moderate than in other classes. In qualitative interviews, it was suggested that farmers learn from their neighbours and often from those who are of moderate or better-off in socio-economic terms. Households in the moderate socio-economic group were seen as having a higher risk-taking behaviour given their motivation to move to the top class. However, pro-poor targeting of technologies and inputs was perceived as fuelling community wide food insecurity because the poor, who typically lacked labour, had the least capacity to utilise the inputs and technology to produce sufficient food stocks. Moreover, richer households were seemingly less keen to try pro-poor technologies but if targeted at them, it is highly likely the overall uptake across the village would be much higher.

5.3 Physical Assets

Physical asset ownership is used for poverty and vulnerability assessment in Malawi. Ownership and accessibility of physical assets in the study areas was used to evaluate how different physical assets produce coping and adaptation outcomes in the face of drought and other stresses.

5.3.1 Household utility asset ownership

Table 5-12 shows that almost one in two households owned a bicycle, and a similar proportion owned a radio. Cell phones were owned by almost one in every three households. The focus on these three assets was critical for the study given the direct linkages between these assets and responses to drought. The study found that bicycles could be hired out for cash, or used to access distant ganyu; cell phones enabled better access to market information in terms of food availability and also cut down on travelling frequency, thus saving time for other activities; radios were a source of seasonal forecasts which had the potential for assisting farmers in decision making. Even households that did not own these assets had means of accessing them, especially through their social network or various exchanges.

Table 5-12: Household physical asset ownership

	N	Bicycle	Cell-phone	Radio	Television	Solar panel
Nsanje	100	49.0%	29.0%	47.0%	0.0%	0.0%
Mzimba	95	52.1%	31.6%	56.8%	5.3%	6.3%
Total	195	50.5%	30.3%	51.8%	2.6%	3.1%

Source: Author, 2012

Given that these different assets had the potential to contribute to household response to adverse conditions, the study sought to identify which social groups were likely to respond better by having the advantage of owning these assets. Household characteristics such as gender and education status of the household head, as well as the size of the household were used. Chi-square tests were used to examine whether there were any significant differences in asset ownership for the three social variables. The results are presented in **Table 5-13**.

Table 5-13: Demographic factors influencing ownership of physical assets

Predictor		Physical assets				
		Bicycle	Cell phone	Radio	Television	Solar panel
Gender HH	N	194	195	195	195	195
	Chi-square	19.286	19.889	29.014	0.191	0.439
	DF	1	1	1	1	1
	P-2 sided	0.000**	0.000**	0.000**	0.662	0.508
Education HH	N	193	194	194	194	194
	Chi-square	15.552	24.766	25.270	4.797	2.251
	DF	2	2	2	2	2
	P-2 sided	0.000**	0.000**	0.000**	0.091	0.325
Size of HH	N	193	194	194	194	194
	Chi-square	2.382	6.401	6.685	1.888	4.791
	DF	2	2	2	2	2
	P-2 sided	0.304	0.041*	0.035*	0.389	0.091

Source: Author, 2012

Table 5-13 indicates a significant association between the social categories of gender, education and household size with ownership of physical assets. **Figure 5-1** and **Figure 5-2** show that higher proportions of male headed households owned at least a bicycle (60.4%), cell phone (39.6%) or radio (64%) compared to female headed households with 25.5%, 21.4% and 7.1%

for the three assets, respectively. Households asset ownership was influenced by a number of factors: respondents in both areas reported that women had less interest in following current affairs and, as such were less likely to own a radio and more likely to sell a radio when faced with stress. Males generally played a more dominant role in food sourcing and ganyu, and thus a bicycle was a strategic asset. While women also cycled, most female headed households would have already ceded such assets to their spouses' relatives at their death. Increasing level of education was associated with an increased likelihood of ownership of physical assets, given opportunities for higher non-agricultural income. In general, males were more likely to attain education beyond primary school than females. 72.1% of household heads with secondary education owned a bicycle, compared to 31.4% of those that had no formal education, and 51.5% for the median category with primary education. A similar trend was observed with ownership of radios and cell phones. The three social variables were not significantly associated with ownership of television and solar panels, which were both considered luxury goods. Television sets or solar panels were mainly acquired as gifts from children or relatives working elsewhere.

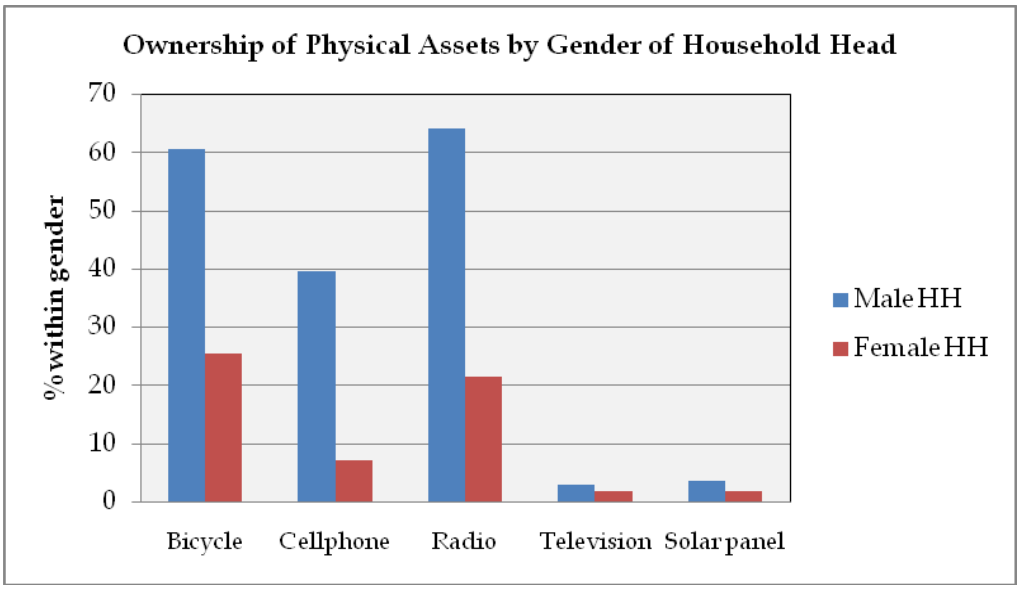


Figure 5-1: Ownership of Physical Assets by Gender of Household Head

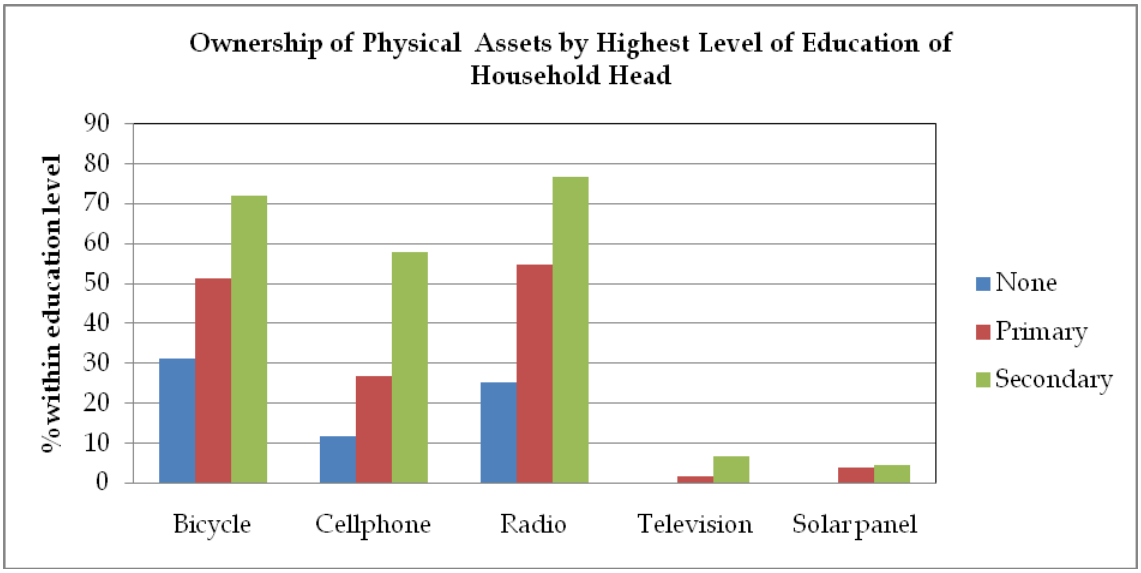


Figure 5-2: Ownership of Physical Assets by Highest Level of Education of Household Head

Figure 5-3 shows that across all asset categories, larger households had significantly higher chances of ownership than any other household size classification. Reasons accounting for higher asset ownership among larger-

sized households included (1) better opportunities for sending out family members as migrant labour, with cell phones and radios being received in gifts or purchased using remittances and (2) higher aggregate income where the larger-sized household was composed of economically active members.

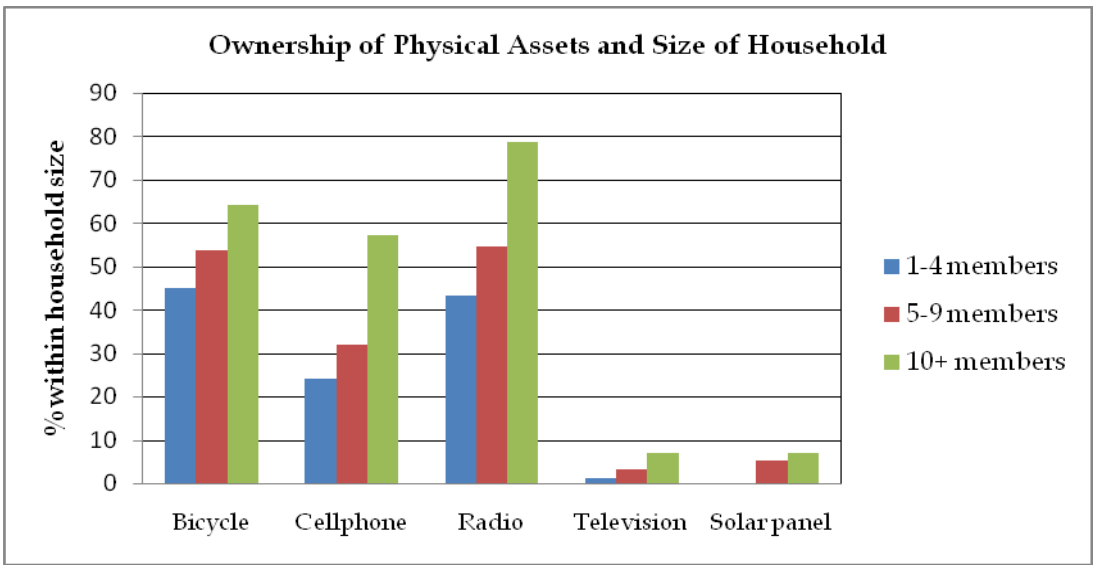


Figure 5-3: Ownership of Physical Assets by Size of Household

5.3.2 Household productive asset ownership

The descriptive analysis of data in **Table 5-14** indicates generally low levels of physical asset ownership. The median value of zero across most assets, with the exception of the hand hoe and axe, is indicative of high levels of physical asset poverty in the study areas. The average household had three hand hoes, compared to the average household size of five people; and one axe which competed between such roles as firewood collection and land clearance as a ganyu activity. One machete was 'shared' by an average of

two households, while only 10% of all households owned a treadle pump for small scale irrigation.

While the frequency of ox-drawn plough was moderately low at one for every six households, ox drawn carts were even fewer at one shared by twelve households. The low frequency of the plough and cart was attributed to low cattle ownership especially in Nsanje district. It should also be noted that sharing was not always possible due to a host of local politics of access and conflicts.

Table 5-14: Household level livelihood asset ownership

	N	Frequency	Valid Percentage	Mean	SE of Mean	Median
Implements						
Hand hoe	194	192	99	3.53	0.18	3.00
Axe	194	143	73.7	1.30	0.09	1.00
Machete	194	94	48.5	0.68	0.07	0.00
Treadle pump	194	19	9.8	0.14	0.03	0.00
Ox-drawn plough	195	17	8.8	0.17	0.04	0.00
Ox cart	195	10	5.2	0.08	0.02	0.00
Structures						
Chicken run	195	52	26.8	0.34	0.04	0.00
Granary	195	49	25.3	0.38	0.06	0.00
Livestock kraal	194	47	24.2	0.35	0.05	0.00
Pig sty	195	20	10.3	0.18	0.05	0.00

Source: Author, 2012

Qualitative interviews showed that, in terms of responses to drought, the value of most of the productive assets, including hand hoes and axes, was determined by the ease with which they could be sold for cash or exchanged for food. Droughts therefore led to an increase in productive asset sales thereby reducing capacity for timely land preparation and weeding or

engagement in ganyu. Some respondents reported that even in fairly good years, lack of farming implements often delayed field operations.

Household ownership of physical structures such as granaries and livestock shelter was very low at about 25% of the sample population. This observation is linked to the low stocking levels across livestock classes, coupled with such factors as high theft incidence and lack of income generating alternatives outside asset liquidation. 25.3% of all households interviewed had at least a granary for food storage, with the rest storing food inside the house. The low crop yields and high risk of crop theft were cited as factors discouraging construction of food storage structures outside.

5.3.3 Most important asset in a drought

Respondents were asked to identify an asset they felt was most important in enabling them to survive a drought. The results are shown in **Table 5-15**.

Table 5-15: Most important asset in drought

	Most important asset in drought									Total
	Bicycle	Land	Hand hoe	Livestock	Ganyu	Radio	Cell phone	Not sure	Other	
Nsanje	29	2	12	8	12	8	0	12	9	92
	31.5%	2.2%	13.0%	8.7%	13.0%	8.7%	0.0%	13.0%	9.8%	100.0%
Mzimba	21	0	8	12	3	17	4	10	15	90
	23.3%	0.0%	8.9%	13.3%	3.3%	18.9%	4.4%	11.1%	16.7%	100.0%
Total	50	2	20	20	15	25	4	22	24	182
	27.5%	1.1%	11.0%	11.0%	8.2%	13.7%	2.2%	12.1%	13.2%	100.0%

Source: Author, 2011

27.5% of respondents rated bicycle ownership as the most important in enabling effective response to drought. Bicycle ownership was associated with increased ability to access distant food markets, access distant ganyu

and in extreme cases sold or exchanged for food. Ownership of a hand hoe was identified by 11% of respondents as crucial in a drought year as it enabled one to participate in ganyu. Availability of ganyu itself was classified as an asset by 8.2% of respondents. Radios and livestock were assets of value in drought response for 13.7% and 11% of all households interviewed. In both cases, the value of the assets in drought response was associated with their disposal for cash or food. Cell phones as information technology gadgets were rated lowly (2.2%). Land owned was considered a valuable asset for surviving a drought by only 1.1% of the study population.

The choice of the most important asset for surviving drought differed significantly with gender of household head (X^2=20.135; df=8; p=0.010, 2-tailed) and their location (X^2=19.182; df=8; p=0.014, 2-tailed), among other factors. 31.3% and 17.6% of male and female headed households, respectively, identified the bicycle as most important asset in a drought year. 27.5% of female headed households were unsure what asset they valued most for enabling response to drought, compared to only 6.1% for male headed households. In terms of location, clear differences were noted on the choice of hand hoe in Nsanje (13%) compared to Mzimba (8.9%) and reliance on ganyu cited by 13% and 3.3% by respondents in Nsanje and Mzimba, respectively.

There were differences in defining the priority asset for rescue in the event of flooding. Women prioritised rescuing pots and pans and food, if there were any, while men emphasised rescuing livestock and seed, where possible, to

enable a faster recovery after the flood. In all cases, however, especially with the high impact floods experienced, the losses from floods tended to position the local communities as very vulnerable to droughts in the successive season as the loss of assets meant they had nothing to sell to buy food, or had no food and seed reserves. Rebuilding one's home after a flood was a major source of income diversion, with a significant effect on household's recovery capacity. The number of households that have had to rebuild their houses is shown in **Table 5-16**.

Table 5-16: Percentage of houses reconstructed after floods

		District		
		Nsanje	Mzimba	Total
N		99	95	194
Ever had to reconstruct after flood or heavy rain?	Yes	38.4%	12.6%	25.8%
	No	61.6%	87.4%	74.2%
Total		100.0%	100.0%	100.0%

Source: Author, 2011

Some 38.4% of households in Nsanje had to rebuild houses following a flood event. This is substantially higher than the situation in Mzimba where 12.6% of households were affected. While rebuilding after a flood may be viewed as a time and resource diversion, respondents interviewed appeared to regard rebuilding like any other task, with no sense of loss or panic. Nonetheless, rebuilding was associated with compromised household food security and increased household exposure to other shocks such as drought. Flood resilient construction for houses or other communal infrastructure like boreholes was not a priority at district planning level given that construction depends on the home-owner's budget. **Figures 5-4** and **Figure 5-5** show a

house susceptible to flooding and one with physical resilience to flooding. The house located to the right has a raised floor level and drainage system to reduce flood impact.

Source: Author, 2010

Figure 5-4: House made from reeds and grass in Nsanje

Source: Author, 2010

Figure 5-5: House with raised floor and drainage system in foreground, Nsanje

5.4 Natural assets

Natural assets are fixed and their contribution to resilience was assessed by focusing on accessibility and quality. Four categories were considered: land; soil; pastures, and genetic resources. Forest and fishery ecosystems which are an important source of food, energy through firewood, cash income, medicine and other services especially during the lean months were also considered.

5.4.1 Land ownership

In the agro-based livelihood systems that characterise the study areas, land is a key resource for ensuring food and income security. Land ownership was considered for both dry land or rain fed, and irrigated land (including wetlands, flood plains and stream bank).

5.4.1.1 Ownership of rain-fed land

Almost 95% of all respondents interviewed owned at least some piece of rain-fed land on which to practice agriculture, the remaining 5.2% were landless. Average land ownership was much lower in Nsanje where 60.4% of the population owned less than 1 hectare of land as compared to Mzimba with 46.3% for the same category (**Table 5-17**).

As shown in **Table 5-17**, despite an insignificant difference in the proportion of farmers owning between 1.1 hectares and 3 hectares of land between the two districts, Mzimba had substantially more households owning more than 3 hectares of land (16.9%) compared to Nsanje (1%).

Table 5-17: Ownership of land in the dry lands of Nsanje and Mzimba

		District		
		Nsanje	Mzimba	Total
N		96	95	191
Land owned in dry land	0 hectares	8.3%	2.1%	5.2%
	Up to 1 hectare	60.4%	46.3%	53.4%
	1.1 to 2 hectares	26.0%	28.4%	27.2%
	2.1 to 3 hectares	4.2%	6.3%	5.2%
	3.1 hectares +	1%	16.9%	8.8%
Total		100.0%	100.0%	100.0%

Source: Author, 2012

This result is consistent with the national picture which depicts the Northern region as less densely populated when contrasted with the Southern region. However, even within districts studied, there was high inequality in terms of land ownership, given the range from 0 to 5.4 ha and 0 to 8 ha per household in Nsanje and Mzimba, respectively. Average landholding per household was 0.84hain Nsanje, less than half the mean in Mzimba (1.77ha). **Table 5-18** summarises the key statistics relating to land ownership.

Table 5-18: Household land ownership in Nsanje and Mzimba

	Descriptive Statistics							
Rain fed land owned (ha)	N	Range	Minimum	Maximum	Mean	SE of Mean	Std. Dev	Variance
Nsanje	100	5.40	.00	5.40	.8396	.07697	.770	.593
Mzimba	95	8.00	.00	8.00	1.7726	.17732	1.728	2.987
Total	195	8.00	.00	8.00	1.2942	.10047	1.403	1.968

Source: Author, 2011

The association between access to land and use of drought management practices and other production promoting practices was evaluated by use of Chi-square test for significant difference. The results are presented in **Table 5-19.**

Table 5-19: Effect of amount of dry land owned on utilisation of drought management strategy

Technology for drought management	N	Chi-value	DF	P-value
Conservation farming	191	7.692	2	0.021*
Stover treatment	191	11.082	2	0.004**
Improved food storage	189	0.836	2	0.658
Legume incorporation	191	2.266	2	0.322
Fodder production	191	3.819	2	0.148
Water harvesting	190	2.113	2	0.348
Agro-forestry	191	3.329	2	0.189
Winter ploughing	190	2.189	2	0.244
Crop rotation	191	10.518	2	0.005**
Crop diversity	191	22.373	4	0.071

* Statistically significant at 95% confidence interval (p≤0.05); ** statistically significant at 99% confidence interval (p≤0.001)

Source: Author, 2012

Table 5-19 shows that variation in amount of land owned by households produced significant differences in use of drought mitigating practices for conservation farming, stover treatment and crop rotation. Ownership of more rain fed land increased the likelihood of use of both crop rotation and stover treatment (the vegetative parts remaining after the maize grain has been harvested), indicating that the technologies were only seen as economical for slightly larger fields. Stover treatment involved application of urea to maize stover to enrich the stover prior to livestock feeding. As such, stover treatment was done mainly by cattle owning households and because this practice was scale-dependent, households with larger fields could produce sufficient stover for this purpose.

Some of the respondents interviewed in Nsanje argued that where land was limited, conservation farming was not an attractive practice because the wide inter-row spacing (ranging from 60cm to 90cm depending on training provider) was a waste of limited land especially when compared to half the

spacing requirement with conventional farming. **Figure 5-6** shows the mixed cropping of cereal and legume with 'conventional' farming and **Figure 5-7** shows a field prepared for a maize mono-crop under conservation farming. The cropping density is much smaller under conservation farming than with the conventional practice.

Source: Author, 2011

Figure 5-6:Conventional cereal-legume intercrop

Figure 5-7: Field prepared for maize planting with conservation farming

5.4.1.2 Access to Irrigated land

Table 5-20 shows that 37.7% of households had access to irrigation. Contrary to the initial expectation that more farmers in Nsanje would have access to irrigation due to proximity to the large rivers, Mzimba in fact had a higher proportion of farmers accessing irrigation (75.3%) relative to Nsanje (48.9%), indicating that the infrastructure for irrigation was less developed in Nsanje relative to Mzimba.. One key informant interviewed at the District Council in Nsanje remarked:

> *"Nsanje has 2000 hectares under irrigation, but the district has a potential of bringing 62000 hectares under irrigation. This district actually has potential to feed not only itself, but the whole country!"*
>
> Eric Banda*, Key Informant Interview, Nsanje District Assembly

Differences in access to irrigation between the two districts were particularly visible at the village level. In Nsanje access to irrigation was dependent on physical location relative to water sources and likelihood of flooding. Households sampled in upland located villages such as Chibuli and Mbadzo in Nsanje did not have access to irrigation. In Mzimba, with the exception of Mteyo Ngoma, all villages had at least 50% of households irrigating.

Table 5-20: Proportion of households with access to irrigation in Nsanje and Mzimba

	Villages	N	Access to irrigation		Total
			Yes	No	
Nsanje	Khasu	24	33.3%	66.7%	100.0%
	Mbadzo	25	0.0%	100.0%	100.0%
	Nyachikadzi	24	66.7%	33.3%	100.0%
	Chibuli	24	0%	100.0%	100.0%
Mzimba	Mteyo Ngoma	25	32.0%	68.0%	100.0%
	Jamu Kaluwa	25	56.0%	44.0%	100.0%
	Chiputa	24	58.3%	41.7%	100.0%
	Joseph Mumba	20	60.0%	40.0%	100.0%
Total		191	37.7%	62.3%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	50.918a	7	.000
Likelihood Ratio	66.830	7	.000
Linear-by-Linear Association	13.480	1	.000
N of Valid Cases	191		
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.54.			

Source: Author, 2011

The Chi square test indicates a significant difference in proportions of households with access to irrigation on the basis of village of residence (X^2=50.918; DF=7; p=0.000). The total amount of land under irrigation for the study sample was 23.92ha in Nsanje and 20.88ha in Mzimba. The distribution of land under irrigation, however, was more skewed in Nsanje relative to Mzimba, as shown in **Table 5-21**. The maximum landholding under irrigation was 2 ha in Mzimba and 4ha in Nsanje.

Table 5-21: Ownership of land under irrigation

		District		
		Nsanje	Mzimba	Total
N		97	94	191
Land owned in irrigation	0 ha	75.3%	48.9%	62.3%
	Up to 1.2ha	18.6%	47.9%	33.0%
	More than 1.2ha	6.2%	3.2%	4.7%
Total		100.0%	100.0%	100.0%

Source: Author, 2012

75% households in Nsanje had no access to land under irrigation compared to 49% in Mzimba. Nsanje had a higher proportion (6.2%) of households with more than 4hectares of land relative to Mzimba (3.2%). These figures support the idea that resources were highly concentrated in only a few individuals.

5.4.1.3 Source of land owned

The limited range of income and food sourcing opportunities coupled with weak market infrastructure makes production based food entitlement a priority for most households in the study areas. Consequently, access to land has a strong bearing on food production capacity and household food and nutrition security. The study focused on the source of land owned as a basis for understanding the effects of land tenure system on drought coping capacity. **Table 5-22** indicates that land is predominantly obtained through inter-generational transfers on either paternal or maternal lineage depending on the social system. 75.5% of respondents interviewed had inherited the land they were using from their parents. In the patriarchal district of Mzimba, 95.7% of respondents had received land from the paternal side. Nsanje, on the other hand, had a mixed marital system. 55.4% of respondents interviewed identified paternal transfer as the main source of land owned. 12% of land was received along the matrilineal line.

Table 5-22: Source of land in Nsanje and Mzimba

	Nsanje	Mzimba	Total
N	92	92	184
Inherited from father's side	55.4%	95.7%	75.5%
Given by local leader	19.6%	2.2%	10.9%
Inherited from mother's side	12.0%	1.1%	6.5%
Bought through informal market	10.9%	†	5.4%
Renting land from someone	1.1%	1.1%	1.1%
Other	1.1%	†	.5%
Total	100.0%	100.0%	100.0%

Source: Author, 2011

Traditional leaders appeared to have a more prominent role in distributing land in Nsanje (19.6%) as compared to Mzimba (2.2%). Despite 10.9% of land in Nsanje being market sourced, there was no single case of market sourced land in Mzimba. Flood displaced households and returnees were more likely to purchase land in the uplands of Nsanje, although some lowland based households only migrated seasonally at the onset of flooding and returned following flood recession. One in every 100 households was using rented land in Nsanje. Rented land was associated with a set of clear rules such as non-modification of land through pit-digging and non-introduction of new crops. As such, farmers renting land could not innovate or benefit from innovation. Moreover, even where rules were flexible, land was only available for a short period thereby pre4cluding the realisation of any benefits. In group gardens, agricultural extension officers tended to influence the range of activities that could be practiced. While the influence of extension officers promoted uptake of technology in its intended form, it often restricts capacity to modify and adapt the practices to local circumstances.

The land tenure system in both districts was characterised by intergenerational sub-divisions creating smaller fields and high land use intensity. Respondents reported that land inheritance has been practiced across generations. However, as populations continue to grow and people remain dependent on farming, average land holding size per household has fallen while land use intensity increased.

5.4.1.4 Soil type and quality

The ability of soils to ensure moisture and nutrient retention is influenced by their biophysical and chemical properties. Factors such as position on the catena and on slope relative to water table as well as the general soil classification were reflective of the water and nutrient holding capacity.

Soil water and nutrient retention capacity had implications for workability of the soil. Clays are unworkable when wet thereby delaying planting although they have the benefit of good water and nutrient retention which promoted crop growth. Clayey soils were reported to bake or crust during the dry months and this made digging basins for conservation farming very difficult. In contrast, sandy soils leach easily and therefore require higher fertiliser application. Water retention is much lower in sandy than other soil types, rendering crops on sandy soils more at risk of drought. **Table 5-23** shows the main soil types for the eight villages studied.

Table 5-23: Predominant soil type on land owned

			Predominant soil type			
District	Village	N	Clay	Loam	Sandy	Total
Nsanje	Khasu	26	3.8%	92.3%	3.8%	100.0%
	Mbadzo	25	†	100.0%	†	100.0%
	Nyachikadzi	24	37.5%	33.3%	29.2%	100.0%
	Chibuli	24	8.3%	83.3%	8.3%	100.0%
Mzimba	Mteyo Ngoma	25	20.0%	68.0%	12.0%	100.0%
	Jamu Kaluwa	25	28.0%	48.0%	24.0%	100.0%
	Chiputa	25	28.0%	68.0%	4.0%	100.0%
	Joseph Mumba	20	40.0%	45.0%	15.0%	100.0%
TOTAL		194	20.1%	68.0%	11.9%	100.0%

† 0 cases observed

Source: Author, 2011

A farmer based classification of soils in their fields, as shown in **Table 5-23**, indicates that loamy soils were the most predominant soils in the two districts. Clayey soils occurred more prominently in Mzimba averaging a quarter of all soils for the four villages sampled. In Nsanje, some respondents reported that clayey soils tended to bake in summer, making the digging of planting basins for rainwater harvesting with conservation farming a backbreaking activity. The same technology was also discredited in light textured soils on the argument that planting basins were prone to wind and traction effects which meant re-digging prior to planting. Sandy soils were more confined to specific locations such as Nyachikadzi in Nsanje (29.2%), and Jamu Kaluwa (24%). In the former case, the low water retention capacity of sands was not a critical issue in the case of managing floods, but may have affected profitability of crop production with flood recession irrigation, as well as increased demand for nutrient replenishment given the high leaching of nutrients in sandy soils. It was reported in the previous chapter that runoff from the uplands often brought alluvial soil and leached fertilisers to the lowlands, along with weeds.

5.4.2 Plant genetic resources

Seed security underpins food security. Availability of seed on the market or through informal channels was reported to be characteristically diminished in years following drought seasons, with farmers relying on government and NGO assistance to recover from the drought. Some respondents argued that

while the government farm input subsidy programme had a very low coverage, without seed assistance there is a high probability that farmers would have let good seasons pass by without seeding anything due to lack of seed access.

Local varieties of legumes such as bambara nut and groundnut have been severely decimated in recent droughts to the extent that only a few farmers are thought to have the germplasm or planting material. The same was reported for maize where the traditional variety, *chimanga chamakola* or the maize of our ancestors, which typically had resistance to weevils due to its hard testa is now very prone to weevil attack. The loss of germplasm may be attributed to a number of observations made in the study areas. Farmers typically plant all the seeds available for various crops with the hope of selecting seed from the harvest. In the event of a dry spell or drought, all the seed is lost and this decimates the germplasm available in the community. In addition to this, postharvest seed storage systems may render seeds susceptible to damage. For example, maize cobs selected for seed may be hung from the kitchen roof so that it may be smoked to prevent weevil attack. However, prolonged exposure to heat may reduce the viability of seeds and cause poor germination. While local and traditional knowledge based postharvest storage of maize in ash may have been effective with the local maize varieties in the past, the massive level of damage to maize observed in Mzimba raises the question as to whether the local maize is still true to type or has been crossed with other lines that may have compromised

the tough seed coat properties. The images in **Figure 5-8** and **5-9** show maize on cobs covered with ash and stored inside a *nkhokwe* and the exterior of the *nkhokwe,* respectively.

Figure 5-8: Maize with husks on inside a nkhokwe. Ash has been applied as a preservative

Figure 5-9: A traditional nkhokwe in Mzimba

Figure 5-10: Stored maize damaged by pests in Mzimba

Figure 5-11: Maize damaged by the maize grain weevil *Sitophillus zeamays*

Figure 5-10 and **Figure 5-11** show a typical scenario of postharvest damage to maize due to storage pests such as weevils and borers. Yield loss postharvest was calculated based on production minus consumption and sale. **Table 5-24** shows that 21% of all respondents lost between 25% and 50% of their harvest to postharvest pests such as the Larger Grain Borer and mice.

A further 8% lost more than half their harvest to pests. Losses were lower in Nsanje than Mzimba because the former experienced very low mean harvests so that less food was stored and subjected to damage than in Mzimba.

Table 5-24: Post-harvest maize losses in Nsanje and Mzimba in 2009/2010 season

		District					
		Nsanje		Mzimba		Total	
Maize lost post-harvest	<25%	4	13%	39	41%	43	34%
	25-50%	3	9%	23	24%	26	21%
	51-75%	1	3%	6	6%	7	6%
	>75%	1	3%	1	1%	2	2%
	Don't know	4	13%	2	2%	6	5%
	None	19	59%	23	24%	42	33%
N		32	100%	94	100%	126	100%

Source: Author, 2011

Grain losses had implications for seed availability as some struggling households were forced to eat the maize they had saved for seed thereby compromising their ability to plant in the 2010/2011 season. Losses of seed that does not perform well in drought, but is highly preferred for other traits and performs very well in good seasons emerged as an issue of concern for seed security in the study areas. Such losses were seen as compromising the ability to take advantage of the good seasons.

5.4.2.1 Seed preferences and implications for replanting capacity

In the case of maize production, three seed types were being used by respondents *viz* hybrid, landrace or local and open pollinated. Respondents

were asked to identify the seed type they preferred and the one they actually used. The results are shown in **Table 5-25**.

Table 5-25: Preferred and actual maize seed type used in Nsanje and Mzimba

		N	Hybrid	Local	Open Pollinated	Hybrid +Local
Nsanje	Preferred	67	81%	10%	9%	‡
	Actual	69	48%	28%	25%	‡
Mzimba	Preferred	91	63%	33%	4%	‡
	Actual	93	28%	45%	12%	15%

Source: Author, 2011

Table 5-25 shows that hybrid seeds were preferred and used by 81% and 48%, respectively in Nsanje and 63% and 45% in Mzimba. Use of hybrid seed was limited by low purchasing power of many households and the poor market infrastructure. In Mzimba, cultural identity and values positively influenced preference for local maize varieties. 33% and 45% of sampled households in Mzimba preferred and used local maize, respectively, compared to 10% and 28%, respectively in Nsanje.

The factors underpinning preferences varied from one respondent to the other. Hybrids are higher yielding especially if adequately fertilised and can fit within varying season lengths, depending on farmer's conditions and choices. Some varieties have been specifically bred for tolerance to diseases such as grey leaf spot. Open pollinated varieties yield fairly well and have the advantage that seeds can be recycled over three to five years and still give a good but declining yield. Local maize was mainly preferred for properties such as taste and milling and cooking qualities. For example, respondents argued that for the same volume of grain, slightly more flour

can be obtained from the local maize than from hybrid maize, and less flour is used to achieve the required consistency of *nsima* with the local than other maize grain types. As such *nsima* from local maize lasts longer in the stomach. Farmers growing local maize typically save seed and replant year on end. Yields are lowest and most varieties appear to be long season. However, because seed is available, local maize gives a low but guaranteed yield.

In 2009/2010 the capacity to replant following mid-season dry spells was significantly higher in Mzimba (93%) than Nsanje (64.8%) (Chi square=19.874; df=1; p=0.000, 2 sided; N=158). In focus groups, capacity to replant was cited as higher for farmers that were using local maize seed or open pollinated varieties (OPV). Open pollinated variety seed is produced with any human control in the pollination process, unlike in hybrid seed where the seed grower selects the male and female plants that will produce the seed. OPV seed can be recycled across three to five farming seasons and still give a fairly good yield, while hybrids tend to lose their vigour in the second generation and perform poorly if planted from saved seed. The higher use of local maize in Mzimba may explain the higher replanting frequency and higher yields. In contrast, most of the market dependent farmers in Nsanje failed to generate income in the short term to enable purchasing of seed.

5.5 Human assets

Human assets are intangible qualities that are embodied in individuals' investment in education and training. They are defined by such attributes as skill, knowledge, level of education and motivation. The quality of health determines the effectiveness of labour in pursuit of various livelihood strategies (Kawachi, 1999; DFID, 1999). The effect of education, accessibility of agricultural extension officers and household labour availability on use of drought management practices were investigated.

5.5.1 Adult Education

Three categories of education were considered: none, primary and secondary. The third category also included people with education beyond secondary. **Table 5-26** shows the highest level of education attained by household head across the Extension Planning Areas (EPAs) in the two districts.

Table 5-26: Highest level of education attained by head of household in Nsanje and Mzimba

		Nsanje		Mzimba		
		Makhanga	Nyachilenda	Manyamula	Vibangalala	Total
N		51	49	50	44	194
Level of education	None	31.4%	34.7%	34.0%	2.3%	26.3%
	Primary	52.9%	44.9%	60.0%	47.7%	51.5%
	Secondary	15.7%	20.4%	6.0%	50.0%	22.2%
Total		100.0%	100.0%	100.0%	100.0%	100%

Source: Author, 2011

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	36.169(a)	6	.000
Likelihood Ratio	40.954	6	.000
Linear-by-Linear Association	13.568	1	.000
N of Valid Cases	194		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.75.

Education attainment in Mzimba was significantly higher than in Nsanje for the four EPAs considered by the current study (X=36.169; p=0.000; DF=6; N=194). Vibangalala EPA in Mzimba had only 2.3% of household heads without any form of formal education, compared to the category mean of 26.3%. The majority of household heads interviewed (51.5%) had primary level education as their highest level attained, while only a quarter (22.2%) had reached secondary education.

5.5.1.1 Effect of education on utilisation of drought management practices

The effect of education on resilience was evaluated by testing for differences in use of agricultural practices consistent with resilient farming systems across education levels.

Table 5-27: Proportion of respondents using drought management techniques by education level of household head

Drought management technique		Education Level			Total	Pearson X^2	P value
	N	None	Primary	Secondary			
Drought tolerant crops	190	76.0%	85.6%	88.4%	83.7%	3.106	0.212
Drought tolerant varieties	189	63.3%	71.1%	90.7%	73.5%	9.453	0.009**
Water management technique	190	50.0%	49.5%	65.1%	53.2%	3.195	0.202
Seasonal forecast use	190	66.0%	73.2%	65.1%	69.5%	1.303	0.521

Source: Author, 2012

Table 5-27 shows that of the four drought management techniques used in the study area, education had a significant influence only in determining farmer capacity to use drought tolerant varieties. 90.7% of households with secondary education used drought tolerant crops compared to 71.1% and 63.3% of those with primary and no formal education. A total of 83.7% of households planted drought tolerant crops; and 53.2% and 69.5% used some form of water management technique and seasonal forecasts, respectively. In qualitative interviews, use of drought tolerant varieties was described as an income effect, where more educated households were more likely to have higher access to non-agricultural income which, unlike ganyu, is not compromised in a drought year, and therefore better able to afford purchasing short–season, drought-tolerant varieties.

Table 5-28 shows that of the ten agricultural practices associated with promoting crop production, three were significantly influenced by the level of formal education attained by the household head. These were crop rotation, treatment of maize stover with urea prior to livestock feeding and use of compost manure for soil fertility management.

While agricultural extension officers were involved in skills transfer in the above practices, the secondary school training curriculum in agriculture also covered these three aspects.

Table 5-28: Effect of education of household head on use of drought management practices

Drought management technique	Pearson Chi Square	DF	P value 2- sided
Conservation farming	2.032	2	0.362
Improved grain storage	3.660	2	0.160
Water harvesting	4.138	2	0.126
Crop rotation	8.049	2	0.018*
Seasonal forecast use	1.303	2	0.521
Winter ploughing	1.156	2	0.459
Treatment of stover	7.934	2	0.019*
Compost manure	7.071	2	0.029*
Incorporation of legumes	4.061	2	0.131
Increased crop diversity	1.195	2	0.550

Source: Author, 2012

The results above indicate that other factors are more important in determining use of technology for coping with drought other than education. For example, the pro-poor targeting of agricultural development projects and cross-border ganyu meant that even households in the lower socio-economic class could access technologies and utilise them as much as the educated group. A prominent argument raised by respondents in most focus groups was that an individual's attitude rather than their level of education determined the decisions they made regarding new technology since "even the educated behaved like village people". The other dimension emerging from the results was that the household head's education may be insufficient in explaining household characteristics given the influence of different household members in decision making. As well, some practices were a function of resource access rather than education. For example, a medium strength correlation of r=0.282, as shown in **Table 5-29**, was calculated between crop rotation and amount of land owned by the household.

Table 5-29: Correlation between amount of land owned and the practice of crop rotation

		Land owned in dryland	Crop rotation
Land owned in drylands	Pearson Correlation	1	.282
	Sig. (2-tailed)		.000**
	N	191	191
Crop rotation	Pearson Correlation	.282	1
	Sig. (2-tailed)	.000**	
	N	191	195

** Correlation is significant at the 0.01 level (2-tailed).

Source: Author, 2012

5.5.1.2 Household labour availability

Household labour was derived from a combination of household members, pooling labour with neighbours or labour hired from within or beyond the village. Of the 193 households sampled, 28.5% reported insufficient labour supply for implementing various agricultural and livelihood tasks. The percentage was 33% in Mzimba and 24.2% in Nsanje (**Table 5-30**).

Table 5-30: Household level labour characteristics

		District			Difference by location	
		Nsanje	Mzimba	Total	Chi-square	P-value
Household labour adequate	N	99	94	193		
	Yes	75.8%	67.0%	71.5%	1.806	0.179
	No	24.2%	33.0%	28.5%		

Source: Author, 2011

The labour shortage reported was due to multiple factors. **Table 5-31** identifies lack of adequate cash to pay for hired labour as the main reason, accounting for 54.4% of cases of labour shortage. Differences emerge when the two districts are compared: while lack of cash for hiring labour (64.6%)and migration of household members (20.8%) were cited as most

important in Mzimba, in Nsanje cases of illness within the household (30%) and household engagement in ganyu (20%) featured quite prominently.

Table 5-31: Factors limiting capacity to source adequate agricultural labour

		District		
		Nsanje	Mzimba	Total
N		20	48	68
Reason for inadequate labour	Lack of cash to hire labour	30.0%	64.6%	54.4%
	Migration of household member	0%	20.8%	14.7%
	Illness within household	30.0%	6.2%	13.2%
	Death of member of household	10.0%	6.2%	7.4%
	Involvement in ganyu labour	20.0%	0%	5.9%
	Disability within household	10.0%	2.1%	4.4%
Total		100.0%	100.0%	100.0%

Source: Author, 2011

Poverty was identified as by far the most limiting factor as far as access to labour for the primary livelihood activity is concerned. 54.4% of respondents cited lack of cash to pay for hired labour as the main constraint, while 14.7% of households reported the migration of household members to other districts, urban and international destinations as a key driver of shortfalls in labour supply.

Table 5-32 provides evidence that household labour availability was one of several factors that are associated with ability to utilise farming practices promoted as sustainable and drought mitigating. The difference in use of technology was assessed for households reporting labour shortage and those with adequate labour using a Chi Square test as demonstrated in **Table 5-32**

Table 5-32: Effect of labour adequacy on utilisation of drought management strategy

Technology for drought management	N	Chi-value	P-value
Conservation farming	193	8.937	0.003**
Stover treatment	193	1.506	0.220
Improved food storage	191	0.397	0.527
Legume incorporation	193	0.277	0.598
Fodder production	193	2.047	0.153
Water harvesting	192	0.569	0.451
Agro-forestry	193	7.228	0.007**
Winter ploughing	192	11.551	0.001**
Crop rotation	193	7.822	0.005**
Compost manure	193	0.716	0.397

Source: Author, 2011

Conservation farming, agro-forestry, winter-ploughing and crop rotation were four of the ten farming practices where household labour differences had an effect on use of practice. In qualitative interviews, conservation farming and winter ploughing were reported as generally energy demanding and only viable for households with good labour supply. Evidence from qualitative and quantitative data shows that while in some cases labour- constrained households were able to cultivate the same area as labour- sufficient households, their capacity to go beyond the usual practice (traditional practice) and utilise other technologies was often directly or indirectly limited by access to labour.

The effect of inadequate labour was manifested in a number of outcomes, including the inability to plant in time during the 2009/2010 farming season, as demonstrated in **Table 5-33**.

Table 5-33: Percentage of households planting in time and land used in 2009/2010

		Nsanje	Mzimba	Total	Chi Sq	P value
N		98	94	192		
Planting on time		64.3%	47.9%	56.2%	5.252	0.016 *
% of land used	<50%	21.6%	55.8%	38.5%	23.616	0.000 **
	>50%	78.4%	44.2%	61.5%		

Source: Author, 2011

56.2% of respondents interviewed were able to plant in time for the start of the 2009/2010 farming season. Of these, Nsanje had a significantly higher proportion (64.3%) compared to Mzimba (47.9%). **Table 5-33** shows that Mzimba also had the highest percentage of households using less than half the amount of land they had access to in the same season. 55.8% of respondents in Mzimba used less than 50% of their land, versus 21.6% in Nsanje. While labour may have been a factor of importance, it is noted that field sizes in Mzimba were relatively much larger and therefore, even where a small proportion was used, effective land under production and total production levels were more likely to turn out relatively larger than fully cultivated smaller plots in Nsanje.

Compounding labour shortage was the need to provide casual labour for cash income. As shown in **Table 5-34**, the peak demand for casual labour fell during the land preparation (14.5%) and weeding (80.8%) phases of the farming season. In general, these phases coincided with high food and income insecurity, as well as malaria related morbidity, thus decimating household labour availability for agriculture through driving reallocation of existing labour in favour of casual labour. Traditionally delayed planting is

associated with delayed yield potential. The experiences from the field were mixed: some of the farmers who delayed planting outperformed their colleagues who had planted earlier and faced a long dry spell. In some villages, on the contrary, those farmers that delayed planting performed poorly.

Table 5-34: Peak labour demand within the farming season

		District		Total
		Nsanje	Mzimba	
N		99	94	193
Stage of peak labour demand	Land preparation	3.0%	26.6%	14.5%
	Planting	1.0%	5.3%	3.1%
	Weeding	92.9%	68.1%	80.8%
	Harvesting	3.0%	0%	1.6%
Total		100.0%	100.0%	100.0%

Source: Author, 2011

In comparison with land preparation and weeding, fewer respondents ranked planting and harvesting as the main phases requiring intensive labour. This does not discount the fact that labour demand was substantially high during the harvesting phase as food and income insecure households sought ganyu opportunities from households growing cash crops. In-depth interviews into the 'traditional' practice where maize is stored without prior shelling revealed that it was, in fact, the lack of sufficient labour at the postharvest stage that discouraged the labour intensive process of shelling.

5.5.2 Access to agricultural extension services

Access to extension advice was considered pertinent to understanding human asset value in the study areas on the basis that presence of extension

officers improves opportunities for accessing technical advice and guidance by farmers, hence higher productivity. In terms of accessibility of extension services, **Table 5-35** shows that 75.8% of households sampled described extension services as easily accessible, while 12.9% and 11.3% ranked accessibility of extension in their areas as somewhat difficult and very difficult, respectively. Accessibility of extension services referred to ability to consult an extension officer when such a need arose, and took into account distance travelled, time and availability of the extension officer.

Table 5-35: Ranking of ease of access to extension services

		District		
		Nsanje	Mzimba	Total
Ease of accessing extension services	N	99	95	194
	Advice very accessible	79.8%	71.6%	75.8%
	Somewhat difficult	14.1%	11.6%	12.9%
	Very difficult	6.1%	16.8%	11.3%
Total		100.0%	100.0%	100.0%

Source: Author, 2011

Complementing technical knowhow from extension officers was the household member who had received training in agriculture. There was no statistically significant difference in the percentage of households with at least one member trained in agriculture between the two study areas. **Table 5-36** shows that 75% of households in Mzimba and 66% in Nsanje had at least one member trained in agriculture.

Table 5-36: Households with at least a member trained in agriculture

		District		Total
		Nsanje	Mzimba	
	N	97	92	189
Household member trained in agriculture	Yes	66.0%	75.0%	70.4%
	No	34.0%	25.0%	29.6%
Total		100.0%	100.0%	100.0%

Source: Author, 2011

5.5.3 Health status

The value of human assets to livelihoods is expressed through capacity of available labour to conduct tasks relevant to livelihoods. The experience of ill-health within households was recorded with specific emphasis on malaria, diarrhoea and chronic illness (**Table 5-37**).

Table 5-37: Percentage households reporting illness in 2009/2010 season

	Malaria	Diarrhoea	Chronic illness
Nsanje	34.7% (n=95)	26.5% (n=98)	17.2% (n=99)
Mzimba	53.2% (n=94)	21.3% (n=94)	26.6% (n=94)
Total	43.9%(N=189)	24.0% (n=192)	21.8% (n=193)
Chi square	6.533	0.727	2.515
P- value	0.008	0.247	0.079

Source: Author, 2011

Malaria was the most prevalent illness affecting 43.9% of all households studied, and over half the number of households in Mzimba. 24% of all respondents interviewed reported at least a single case of diarrhoea within their household within the year prior to the survey. The incidence was 26.5% in Nsanje and slightly lower at 21.3% in Mzimba. Chronic illness, which included such conditions as HIV/AIDS, affected 21.8% of all respondent households. 26.6% of households interviewed in Mzimba, where higher rates of emigration were recorded, were affected by chronic illness compared to

17.2% in Nsanje. In general, illness was reported as one factor that limited household labour availability at household level.

Table 5-38: Effect of type of illness within household on use of drought and production management strategy

Drought and production management strategy	Malaria		Diarrhoea		Chronic illness	
	Chi sq.	P-value 2-sided	Chi sq.	P-value 2-sided	Chi sq.	P-value 2-sided
Conservation tillage	9.784	0.002**	5.126	0.024*	2.383	0.123
Treatment of stover	3.711	0.054	0.247	0.619	2.775	0.096
Improved grain storage	7.434	0.006**	2.822	0.093	4.523	0.033*
Incorporation of legumes	5.823	0.016*	0.824	0.364	0.021	0.885
Fodder production and storage	4.514	0.034*	0.113	0.737	6.865	0.009**
Water harvesting	3.058	0.080	4.058	0.044*	0.282	0.596
Agroforestry	0.089	0.765	1.130	0.288	0.064	0.800
Winter ploughing	0.001	0.970	0.015	0.903	0.039	0.844
Crop rotation	0.008	0.927	0.486	0.486	0.027	0.870
Compost manure	3.486	0.062	4.596	0.032*	0.021	0.885

Source: Author, 2011

Table 5-38 shows that the three illnesses considered had different effects on labour capacity to engage in the various drought and production management strategies. While short term illnesses like malaria and diarrhoea had significant impact on the practice of conservation tillage, households affected by chronic illnesses did not perform any differently to those unaffected. This finding indicates that some of the households may have adjusted to the condition of long term experience of chronic illness. Other potentially high labour demanding practices such as winter ploughing, water harvesting and preparation of compost manure were less affected by illnesses such as malaria given the seasonality of malaria. In all cases, there was no difference in practice of crop rotation, agro-forestry and treatment of stover for households affected by malaria, diarrhoea and chronic illness.

5.6 Social Assets

Social assets were assessed using proxies derived from generalised understanding of how individuals and social networks within the study areas interact through relationships based on reciprocity and trust. Membership of social groups, role within groups and benefit derived from such networks were captured through quantitative and qualitative approaches. The quality of social networks were assessed by looking at the socioeconomic status of the network members from whom households normally derived support for coping with climatic extremes and their impact on food security.

5.6.1 Household membership of social networks

Neighbours and relatives were identified as indispensable sources of coping resources and particularly for psychosocial support, income and food consumption smoothing. In addition to these networks, extended informal and formal groups also provided invaluable support to respondents. Membership in different social groups was not confined to the head of the household; each household member had the potential of having their own network and collectively all these networks supported coping. The elderly and those living with chronic illness or disability, however, appeared to be socially less active. In fact, this group was generally branded 'vulnerable'. Households with some of their members falling within this 'vulnerable group' were more likely to receive different forms of NGO assistance.

Table 5-39 shows only the proportion of respondents who belonged to each one of the various local community groups (hence the figures do not add up to 100%). Almost half (45.4%) of the sampled population were members of some religious group. The main religions in Malawi are Christianity, Islam and local beliefs. While there was no significant difference in religious group membership between the two districts, farmers' associations and group gardens were relatively more common in Nsanje with 42% and 25% of all households being members, respectively, compared to 20% and 16% in Mzimba for the same categories. 38% of households in Mzimba were involved within the activities of the village development committee, relative to 13% in Nsanje.

Group saving schemes were the least common of all social groups, accommodating 8.2% of all households, and mainly those in the higher socio-economic groups who had financial resources to contribute.

Table 5-39: Percentage household membership to social groups

	Districts			Difference	
	Nsanje	Mzimba	Total	Chi square	P-value
N	99	95	194		
Religious groups	45.5%	45.3%	45.4%	0.001	0.979
Farmers association	41.4%	20.0%	30.9%	10.407	0.001**
Village development committee	13.1%	37.9%	25.3%	15.748	0.000**
Group garden	25.3%	15.8%	20.6%	2.652	0.103
Home based care group	18.2%	9.5%	13.9%	3.069	0.080
Group saving scheme	6.1%	10.5%	8.2%	1.278	0.258

Source: Author, 2011

Home-based care support groups were generally less popular in Mzimba where 9% of households were members. The figure was double in Nsanje where prevalence of HIV/AIDS was also reported as substantially higher.

5.6.1.1 Benefits derived from social networks

Social networks existing between individuals, households and communities were identified as critical for survival in the face of multiple socioeconomic, environmental, market or political stress. **Table 5-40** shows some of the benefits enjoyed by members of different social networks.

Table 5-40: Main benefits received by members of different social groups

	Group saving	Group garden	Farmers assoc.	Religious group	Home based care	Village dvt c'tee
N	18	40	59	86	26	48
Access to credit	72.2%	7.5%	10.2%	1.2%	†	6.3%
Food	†	5.0%	3.4%	†	3.8%	†
Psychosocial support	11.1%	2.5%	15.3%	54.7%	61.5%	52.1%
Farm labour	†	2.5%	1.7%	†	†	2.1%
Agricultural advice	†	72.5%	54.2%	1.2%	3.8%	4.2%
Agricultural inputs	16.7%	10%	11.9%	†	†	2.1%
Sense of responsibility	†	†	3.4%	36.0%	30.8%	33.3%

† represents no observation made

Source: Author, 2011

Six social group categories (group saving scheme; group gardens; farmers' association; religious group; home based care group and village development committee) and seven possible benefits from such groups were considered. Data reported in **Table 5-40** focused on the main benefits received from social groups.

The benefits derived from each social group exceeded the primary mandate of these groups. For example, garden groups were spaces for obtaining psycho-social support and not only sharing agricultural know-how. While psycho-social support could not be quantified, respondents reported that receiving motivation, hope, comfort and sympathy during distress, including droughts, from their social networks, in addition to material support, enabled their survival and persistence. Local expressions, proverbs, folklore

and music, among other properties of the local culture, were a component of the psychosocial support system.

Members of garden groups and farmers' associations had relatively better access to advice and subsidised agricultural inputs compared to non-members. Volunteering and social responsibility was generally confined to religious groups, home based care and village development groups. About a third of respondents belonged to each of these three social networks. Of all benefits received by members of different social groups, food and access to farm labour featured the least.

This effect was shown in group saving schemes, nomination into village development committees and other committees such as the food and water point management committee. In particular, it is shown that households in the middle or upper socioeconomic groups tended to dominate these four named local institutions in terms of overall composition and participation in decision making. In group gardens, farmers associations, religious groups and disaster management committees, social class was insignificant as a determinant.

Table 5-41: Proportion of households within socioeconomic groups belonging to different social groups

Social Group	Chronically poor	Transiently poor	Moderate	Better off	Chi-sq.	P value 2-tailed
Group saving	1.50%	3.20%	18.40%	23.10%	18.936	0.000**
Group garden	22.40%	15.90%	23.70%	23.10%	1.309	0.727
Farmers assoc.	29.90%	28.60%	34.20%	34.60%	0.557	0.906
Religious group	47.80%	36.50%	47.40%	57.70%	3.805	0.283
Disaster mgmt.	7.50%	0%	10.50%	7.70%	6.064	0.109
Home based care	10.40%	12.70%	15.80%	23.10%	2.683	0.443
Village dvt com	16.40%	19.00%	44.70%	34.60%	12.904	0.005**
Other committee	0%	3.20%	26.30%	3.80%	29.789	0.000**

DF=3

Source: Author, 2011

Figure 5-12 graphically illustrates the distribution discussed above. It is shown that higher proportions within the 'better off' and 'average' (or moderate socio-economic group) categories were members of various social groups considered.

An important observation made with reference to membership of the various social networks and groups was that people of different socio-economic status valued different benefits even from being members of the same institution. The poor social groups saw social networks as vital for basic survival and valued food, psycho-social support, and agricultural advice from most of the social groups.

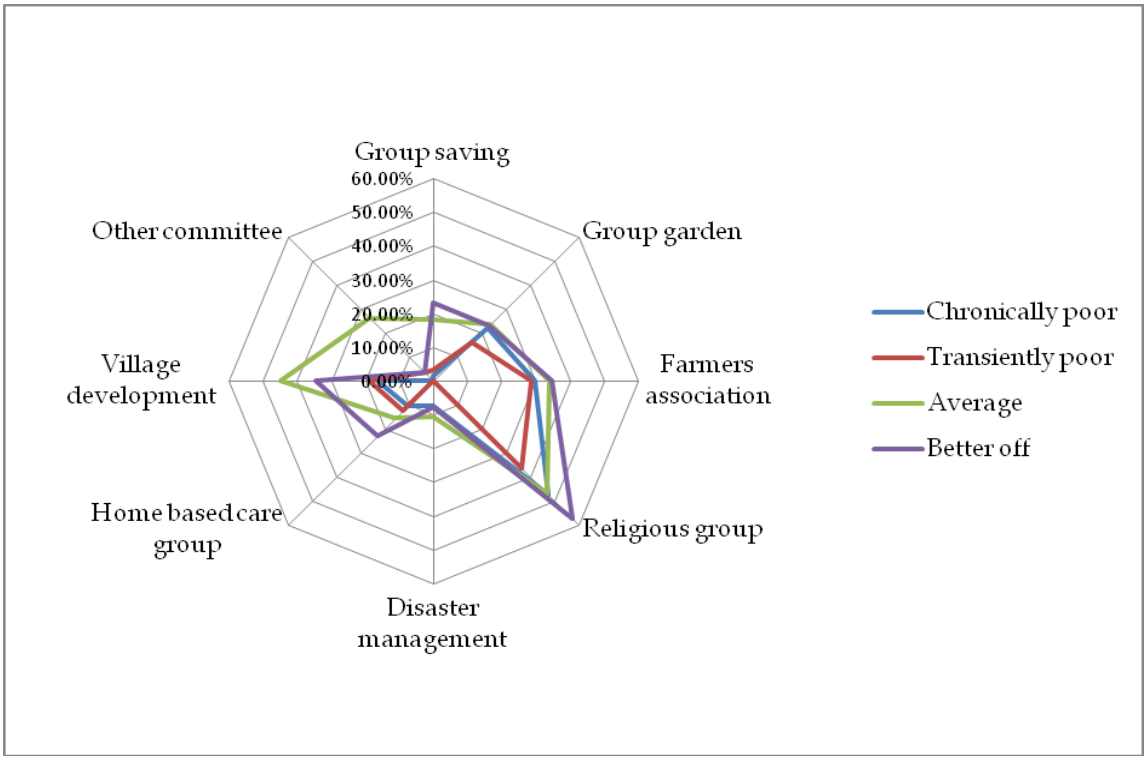


Figure 5-12: Proportion of households within socioeconomic groups belonging to social networks

The moderate socio-economic class and the better off appeared to value the fulfilment of higher order needs such as access to agricultural and market advice, credit, and sense of social responsibility. Through these networks, the rich could procure, and the poor provide, casual labour such that the needs of both were met. Qualitative interviews support this position and show that those with higher access and command of financial assets also had higher social influence on local institutions and benefited differently from the poor, mainly at their expense.

5.6.1.2 Costs of social assets

Social networks were viewed as an asset particularly for household food and income smoothing and support during periods of bereavement or other such

distress. While respondents were generally reluctant to critique local culture as it relates to the costs of social assets, preferring to maintain the view that social networks were a normative good, probing through in-depth qualitative interviews revealed that increasing poverty levels were straining the contribution of social relations to coping. Some respondents argued that there was increasingly less or nothing at all to offer or receive from social networks, especially in the lean season stretching from September to March. The data from the field shows a medium strength correlation in socioeconomic status between self-rated status and respondent rating of the average socioeconomic status of people in their social network (**Table 5-42**).

Table 5-42: Correlation between household and network socioeconomic status

Correlations				
			Respondent socioeconomic status	Rating of social network
Spearman's rho	Respondent socioeconomic status	Correlation Coefficient	1.000	.402**
		Sig. (2-tailed)	.	.000
		N	195	193
	Rating of social network	Correlation Coefficient	.402**	1.000
		Sig. (2-tailed)	.000	.
		N	193	193
**. Correlation is significant at the 0.01 level (2-tailed).				

Table 5-42 suggests that social networks were often organised around social class, whereby poorer households tended to associate more with households of closely similar socio-economic status. In addition, a number of socio-economic changes which are altering the value of social networks under crisis conditions are perceived to be on-going within the study areas. The most prominent one is the increasing commercialisation of ganyu. Where

previously neighbours could pool labour and assist one another, now payment in cash or grain is required. Public works programmes (PWP) such as road construction and river bed dredging, which were being implemented by government and NGOs as part of income poverty reduction and boosting of local infrastructure, were being blamed by some respondents for creating a culture of payment in community improvement projects where locals should have volunteered instead. It was argued that in the future, locals would fail to address local problems if they were not paid for providing their labour. Secondly, the rate of ganyu paid by these PWPs was set too high at (MWK200 per day) given that this rate was adopted as the minimum wage applied across the district, although negotiable. Poor households, therefore, found it difficult to access labour.

Reinforcing labour constraints, especially for agriculture, was the increase in frequency of funerals within the communities. Social norms dictate that every member of the village attends the funeral, which may last up to a week in some cases, and contribute towards funeral and burial costs, including food for the mourners. While such an arrangement eases pressure on the bereaved family, some respondents, while not necessarily challenging this cultural practice, argued that the high frequency of funerals was affecting their ability to produce enough food mainly through rendering labour unavailable during the brief windows of opportunity for ploughing, planting and weeding given the erratic nature of the rainfall.

The study also established that the experience of drought was also a time for creating new networks, some of which transcended the experienced drought and were still being maintained. Some 29.7% of all respondents interviewed reported meeting at least one new contact while coping with the drought experienced in the twelve months prior to the study. New networks were predominantly linked to access to casual work, credit and food.

5.7 Cultural Assets

Cultural assets in the context of household responses to drought were analysed from the understanding that culture as a person's way of life encapsulates the knowledge values, norms, habits, beliefs, attitudes and symbols they hold and therefore, shapes their ability to plan for, cope and adapt to environmental and social changes. Pierre Bourdieu's (1986) conceptualisation of cultural capital as embodied, objectified and institutionalised is used here for organising the multiple perspectives arising from the field study.

5.7.1 Embodied cultural assets

The initial step in the analysis of cultural assets was to identify the local and traditional knowledge (LTK) relevant to agricultural production and especially with regards to seasonal climate forecasts. Some of the LTK based farming practices identified included use of ash for postharvest storage of food; applying anthill soil as fertiliser or growing crops on anthills to

increase performance; treatment of seed with smoke to prevent damage and using the ability to observe animal tracks on pastures as a way of monitoring land degradation. With regards to LTK relevant for managing climatic risks, indicators are based on direct observation of growth phases in trees; sounds and occurrence of specific animal species; and observing the cosmos and state of various weather elements, including wind and temperature. Some of the common LTK based indicators are shown in **Table 5-43**.

Table 5-43: Indigenous indicators for seasonal climate forecasting in Nsanje and Mzimba

Category	Indicators
Plant based	• Abundant fruiting of such trees as mangoes signifies drought; • Shooting and flowering of certain tree or plant species is indicative of the quantity of rain in that season, and also provides an indication that there is sufficient moisture in the soil to plant, and the moisture will be sufficient to carry the seed or seedling through emergence; • Fruiting of wild mushrooms indicates that rainfall is near and farmers should get their seed and ploughs ready;
Animal based	• Sighting a pangolin in Nsanje is associated with drought years. The animal is very rare and is known to survive extreme droughts. Respondents interviewed believed that pangolins drop from the sky, and when spotted they are captured and presented to the chief, king or president as a gift. • Hippopotamus migrating upstream indicate high risk of drought; • Black ants seen carrying food is indicative of the coming of a dry season, hence stocking up reserves underground. In other areas, ants carrying food indicate abundance of food; • The cry of certain birds indicates either the start of land preparation as the rains are near, while in some cases certain bird sounds indicate a dry season; • The appearance of large birds indicates drought;
Meteorological	• The direction of the prevailing wind gives an indication of the likelihood of rainfall; • Observation of clouds gives an indication of likelihood and quantity of rains. The percentage cloud cover is also considered; • The position and movement of the stars and the milky lane in the sky at night provides useful information on the rainfall quality on a given season.

Source: Author, 2011

LTK is largely transmitted orally across generations. The knowledge appears particularly embodied within specific groups such as the elderly within the community, as well as traditional healers and leaders. It is dangerous to assume that locals are aware of this knowledge. Focus group interviews conducted in the two districts showed that substantially high proportions of participants were actually unaware or unversed in 'their local knowledge' with regards to seasonal climate forecasting.

In most of the focus group discussions conducted it emerged consistently that the majority of respondents, especially the young and middle aged, were unaware of seasonal climate forecast indicators. In some cases, only a couple of indicators could be identified by a group of ten or more, or a single respondent could identify half a dozen. A number of factors were identified as limiting access and use of LTK.

LTK is generally perceived as embodied within the elderly, although some of them are equally oblivious of such knowledge. However, perceptions of the elderly as vulnerable, reinforced through targeted food aid has, among other factors, created this new image which renders the elderly sedentary and passive community members. The elderly appear to participate less in community life, and their opinions are hardly sought, as captured in the following statements:

> *"If you are old here you are like a parcel! You move from one shade to the next. What can I do? I am too old to do any work"*
>
> Interview with John Phiri, Manyamula, Mzimba

"In this community, the one with money is the eldest. If you have no money you can't say anything, your opinion is not sought by anyone".

Interview with John Major, Makhanga, Nsanje

In addition to the negative perception of the elderly within the community, younger and middle aged respondents argued that the LTK itself was more mythical than realist and there was no scientific evidence of the credibility of these indicators. Reinforcing the failure to transmit this contested knowledge were the changing environmental and social conditions. Some of trees and animal species that were used as indicators, or the objectified states, have been lost to deforestation and overharvesting as communities started disregarding cultural taboos preventing them from cutting down these tree species from the local environment (some of which have limited dispersal or reproductive cycles). Social changes such as increased family separation due to economic migration and the role of mass and social media could be limiting spaces for the social interaction necessary for intergenerational transmission of LTK.

The current study also identified differences in interpretation of the LTK based indicators for seasonal climate forecasts within and between the two study areas. For example, in Mzimba abundant fruiting of mangoes was seen as indicative of a drought season with fruit being perceived as God's plan to allow for survival following crop failure. Yet in Nsanje some respondents argued that mango trees indicated a bumper harvest. In Mzimba respondents in one focus group argued on whether black ants carrying food indicated a good or a bad harvest. The debates demonstrated that LTK

varied substantially even within locations of close proximity, possibly as a result of misinterpretations and misrepresentations over time. The perception of LTK indicators as inconsistent and inaccurate may be partly aggravated by challenges with the transmission of such knowledge, including the effect of internal migration where new people bring in new interpretations which may lead to confusion. The other limitation of the LTK, as seen in the seasonal forecast indicators in **Table 5-43**, was that the indicators were generally observed at the onset or during the course of the season, which could have been too late for effective deployment of effective responses.

A distinctive feature reported in Mzimba was the gender difference in production of crops, where men were responsible for tobacco while women grew such crops as maize and legumes. Even where women produced tobacco, they were more likely to grow the less harsh version such as oriental while men were responsible for burley tobacco. In addition to this, the respondents interviewed in Mzimba argued that within households livestock were not owned along gender lines, but men and women were custodians of the different stocks e.g. cattle for men and chickens for women. In such an arrangement it may be expected that knowledge for managing the different livestock classes was transferred along gender lines. In Nsanje interviews revealed that even when women owned the land, training in agriculture was normally received by men. For the four EPAs covered by the study, only one

out of fifteen ADOs resident in the study areas was female. This situation indicates a clear gender disparity in the knowledge management system.

5.7.2 Objectified cultural assets

The current study identified a number of cultural goods and symbols of significance for coping with drought and other stresses. In Mzimba, as indicated in the previous chapter, cattle were identified as a symbol of wealth and social status. Initial expectations were that households with cattle would have better capacity to cope with droughts as they could liquidate these buffer stocks and purchase grain when faced with food deficits. However, in practice the study found that even under intense food insecurity, pastoralists were often reluctant to sell their cattle, preferring to maintain them for their cultural role as contributing to a dowry. In Manyamula, some respondents cited examples where a cattle owner would even refuse to sell part of their stock even where doing so would allow them to purchase medication for the rest of the herd in the event of a disease outbreak. In patriarchal societies such as Mzimba the practice of dowry payment in the form of livestock is declining in importance. Factors such as increased mixing of the Tumbuka and Ngoni with matrilineal Chewa as well as increasing poverty levels and increasing preference for cash instead of cattle are seen as being influential in the dearth of dowry or lobola as a cultural practice. As a consequence of the decline in the practice of the lobola culture, opportunities for wealth transfer within communities, which could

theoretically increase household level coping capacity, have been reduced leading to increasing levels of inequality. The reduced role of cattle and the concomitant decline in per capita ownership of livestock was seen as perpetuating increased dependence on chemical fertilisers and the resulting diminishing quality of soils and declining yields (as few farmers could afford chemical fertilisers).

Within the study areas, local knowledge is accessible through folklore, sayings, music and various beliefs, the written word features less prominently. Folk stories told by the elderly around a fire in the evenings provided subliminal lessons and hope of surviving very strenuous life conditions such as drought. This was therapy to communities, and had the potential effect of maintaining hope and a positive attitude, critical ingredients for ensuring persistence in spite of adversity. Increasingly, however, Nigerian movies are wooing crowds from traditional folklore to more contemporary drama. Within communities, performing arts have been adopted as a means of communicating various messages aimed at raising awareness on flood response plans. No such communication systems exist for drought risk management.

In Nsanje, respondents reported a cult that worships a deity known as Mbona. Mbona is believed to have been a rainmaker, and also used magical powers to establish wells and forests where previously there was none. Some respondents suggested that Mbona had defended his people from fire and from enemy attack through, for example, turning enemies into fowls and

other harmless creatures. Mbona was murdered a number of centuries ago, and now people believe he returns to his 'wife' and also blesses the fields. Mbona requires that the fields are level, instead of ridged, because he is now old and unable to walk through a ridged field. Others argued that Mbona was visiting the village in the form of a python and often told prophecies for the following year, including some that are climate related. Following this belief, farmers that use ridges or holes are unlikely to have their fields blessed. An unblessed field is believed to yield poorly. None of the respondents interviewed could provide testimony of having heard any of the prophecies regarding season quality.

> *"Here in Nsanje people believe that there is a spirit medium called Mbona. Before the planting season, Mbona walks across the fields blessing them. But Mbona is now very old and so if you make ridges in your field she won't be able to walk across your field and bless it."*
>
> Interview with Aleck Mbewe, Nsanje Boma

Two perspectives on the effect of ridging on crop production emerged from Nsanje. Consistent with Mbona's followers, ridging on the predominantly flat plains in Nsanje would lead to trapping of water thereby increasing chances of flooding. Localised flooding renders essential nutrients unavailable to crops leading to poor performance. In this case, failure to comply with Mbona results in crop failure as punishment. The alternative perspective offered by agricultural extension officers was that water harvesting techniques on a typically normal to below normal season would increase soil water availability thereby reducing chances of crop desiccation. Water harvesting techniques appeared to be more relevant to the upland

villages compared to those in the lowlands where flooding was frequent. However, for farmers depending on flood recession irrigation, ridge making was a necessary modification for containing water. **Figure 5-13** shows a field in lowland Nsanje that is set for harvesting water for irrigation.

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Source: Author, 2010

Figure 5-13: A field with raised edges for water harvesting for flood based irrigation

Source: Author, 2010

Figure 5-14: The yellow discolouration on this building is one of the constant reminders of flood risk in Makhanga, Nsanje

Figure 5-14 shows one of the buildings in Makhanga in Nsanje that were affec ted by the 2001 flooding. The yellow colouration on the walls shows the height of the flood water, and serves as a constant reminder of the risk and likely magnitude of flooding.

Despite components of local knowledge being given less attention, some traditional cultural artefacts are of value to disaster management. The drum and horn, along with smoke signals, have been used for centuries by communities in Malawi for long range high priority communication. The drum and horn have since been re-incorporated into the early warning and early action systems within village and EPA level disaster management planning. Respondents in Nsanje also noted that these tools were more reliable than radios and cellular phones which tended to lose reception under extreme weather conditions.

In terms of attitudes towards drought risk, respondents in both study areas demonstrated a predominantly fatalistic attitude in which external forces were more responsible for food security outcomes rather than their own capability. A substantial group of respondents interviewed perceived freedom from hunger, disease or social ills as determined by God or ancestral spirits, depending upon affiliation, and not necessarily outcomes on which they had a direct influence. While religion may offer comfort, hope and positive attitude despite severe loss to individuals facing challenging situations, in this case it appeared to reduce discussions on several other aspects of life such as local leadership, quality of development programmes,

development of risk management strategies or organising communities into community based self-help groups. Accompanying this fatalist attitude to drought and other stresses was the general attitude towards agriculture where agriculture is seen as a way of life as opposed to being seen as a business where profitability matters. A casual attitude to farming potentially influences a certain set or type of farming decisions. In livestock farming, for example, a business approach would dictate that a farmer sells part of his herd to insure the rest against theft or drought, or provide veterinary care for the rest; but a-farming as a lifestyle approach hinged on fatalism would probably emphasise other values such as keeping assets for dowry, and by so-doing increasing risk of loss in the event of extreme weather conditions. Most of the planning in agriculture appears to occur within very short temporal scales such as within season, and therefore requiring high levels of flexibility within system, as opposed to long term strategic planning in business oriented farming.

5.7.3 Institutionalised cultural assets

The role of educational qualifications in influencing household responses to drought and other stresses was discussed in the section on human assets. The capacity to invest in education of children was found to be related to the wealth status of households. **Table 5-44** shows that 43.6% of households with children not attending school were within the lowest socioeconomic group, while the better off did not have even a single case of non-school

attendance for children of school going age. The difference in school attendance by socioeconomic status was significant (Chi square=9.064; DF=3; p=0.028, 2-sided).

Table 5-44: Number of households with children not attending school by socioeconomic group

		Rating on level of wealth							
	N	Chronically poor	Transiently poor	Average	Better off	Total	Chi-square	DF	P value 2-tailed
Yes	39	43.6%	30.8%	25.6%	‡	100.0%	9.064	3	0.028*
No	155	31.6%	32.9%	18.1%	17.4%	100.0%			
Total	194	34.0%	32.5%	19.6%	13.9%	100.0%			

Source: Author, 2011

A loss of assets such as livestock was reported to cause a diminished capacity to invest in education of children. Cattle and goats were often sold for the purpose of payment of school fees especially for children of secondary education level. While investment in education was related to higher income and affordability of such technologies as drought tolerant varieties, training in agriculture was perceived as more beneficial in influencing positive attitudes towards agricultural technology uptake.

5.8 Summary and Conclusions

This chapter aimed to examine the contribution of livelihood assets to household resilience to drought and other stresses as well as delineating the different contexts within which assets accessible and available to a household promote or diminish the level of household resilience.

Literature on the effect of livelihood assets on household resilience to drought and other environmental and socioeconomic hazards posits that livelihood assets available and accessible to a household or community are of primary importance in determining the resilience of that entity (Cutter et al., 2008; Keil et al., 2008; Alinovi et al., 2009). In the context of the study area, the respondents interviewed were found to have very low levels of livelihood asset ownership (especially physical, financial and natural) and the extant social networks were predominantly among people of similar socioeconomic backgrounds. However, evidence presented in the previous and current chapter indicates that these households have successfully coped with multiple stresses, including severe droughts and floods, but continue to persist albeit on a lower platform. Qualitative analysis revealed that some non-material assets, based on cultural values, attitudes, worldviews, beliefs and traditional and local knowledge and habits, produce a psychological preparedness to deal with adversity. This finding raises both practical and ontological questions on how resilience should be understood and measured within contexts of asset poverty, where experience of stress does not lead to any change in the livelihood asset base because there are no assets to start with, as well as to the questions "who determines what?", and "who is resilient?" and "on what basis should judgements be made?"

Further, the notion that livelihood assets will lead to higher resilience was questioned on the basis that the identified studies do not explicitly take into account the temporal dimension within which resilience should be

considered. In both Nsanje and Mzimba, respondents highlighted that certain assets enabled better survival of a drought, but on closer examination it was shown that the response capacity is based on the assets being lost in the process, implying lack of capacity to respond to future shocks unless the asset can be recovered within a short duration. Thus, an asset approach that does not consider the longer term 'asset life' is likely to offer an illusion of resilience. Moreover, some assets such as hand hoe and bicycle which were seen as vital for accessing ganyu employment, enabled short term survival through food and income earned, at the expense of longer term resilience. Households engaged in ganyu, for example, were less capable of adopting any adaptation strategy that required more labour than the existing practice. Labour emerged as one significant limit to household resilience to drought. Availability of certain assets did not always confer higher resilience. A case in point is livestock, where cattle played a higher cultural role in payment of dowry and could not be easily liquidated to enable coping with stresses. However, on the contrary, it appears that households owning such assets as cattle were easily excluded from social protection programmes on the basis of perceived lower vulnerability, and therefore were more exposed to hazards than their 'poorer' neighbours who could receive seed and food aid.

Existing literature on livelihood assets and resilience offers limited analysis of the emergence of classes on the basis of livelihood assets. In the study areas, households with livestock and more land were associated with higher attainment of education and investment in children's education. Based on

the financial and physical assets, the study areas exhibited three main social classes: the poor who comprised the majority, a narrow moderate socio-economic group and a small but very wealthy socio-economic group. While the poor depended mainly on informal institutions, ganyu and food aid, the moderate socio-economic group class exhibited traits like higher educational attainment, asset ownership and participation in local institutions. Most importantly, those with moderate socio-economic status showed the highest motivation to take up new technologies, and had equally suffered more from livelihood diversification strategies that failed. The better off, or the local upper class had more interaction with formal institutions, networked with similarly rich contacts, and had influence and dominance in terms of asset ownership and decision making. The behaviour of these three groups provided an insight that the meaning of resilience and strategies for building it will vary with the hierarchy of needs. The poor households were concerned about survival, while the moderate socio-economic group were more concerned about protecting the assets they owned, recovering from any losses and moving to a better state where possible. The rich households perceived resilience as the capability to maintain the lifestyle they enjoyed through resisting stresses, e.g. through irrigation, early recovery and livelihood diversification. The rich had access to other assets, such as credit, at a lower cost compared to the poorer households.

A successful response to drought cannot be determined by demographic characteristics such as gender, age, education status or household size. The

results presented here showed that it is, rather, the conditions within which different demographic groups exist, such as access to labour and land, that determine the capacity to respond. Variables like education were seen to influence access to non-agricultural income which enabled purchase of hybrid seeds. However, for the majority of drought management options it was clear that the farmer's attitude to risk and how their values and previous experiences influenced their behaviour was more important. In general it was shown that respondents perceived agriculture as life rather than a business, and surrendered their survival to higher powers, implying that agency to make certain decisions was constrained. However, on the other hand, such attitudes may have contributed to longer-term survival.

Cutter et al. (2008) among others, argue that household social networks and presence of faith- based organisations are good indicators of resilience to hazards. The current study concurs with the view that social networks offer psycho-social support that allows survival of high levels of distress. However, social networks and social values were also found to present costs to livelihoods. Attendance at social events such as funerals, for example, could derail a household from planting in time and prevent members of a village from harvesting anything, given the highly erratic nature of rainfall. As such networks would normally comprise people of similar socio-economic background who were also likely to face similar insecurities and vulnerabilities. Belonging to these networks, therefore, had little economic gain in terms of accessing strategic resources for coping with drought and

other stressors. The chapter concludes that assets that cannot be converted into other forms that contribute directly to a response are less important in contributing to the overall resilience of a system.

The overall resilience of a food system was seen to be a function of the resilience of different components of the system. For example, localised seed systems comprising local seed were seen as more likely to promote food system resilience as opposed to market-based maize hybrid seed which depended on multiple factors, some of which the household had limited influence over. It was shown that a resilient seed system was inadequate to support a resilient food system if other system components such as post-harvest storage were weak. Another vital component was the local knowledge management system. Within the local cultural context, the study showed that local and traditional knowledge (LTK) is vital for informing risk management practices, but the time scale of LTK based indicators is useful mainly in the very short term and farmers may not have sufficient time to adjust to these indicators. Further, there were questions in terms of the spatial extent of a particular LTK, as well as the different interpretations of LTK based indicators. The embodiment of LTK among the elderly, socio-economic changes and the perception of the elderly as vulnerable pose a danger to the transfer, valuing and utilisation of the knowledge they hold. Cultural changes were also seen as weakening the role of some traditionally valued assets, leaving communities with limited resources as a buffer stock for hedging against stresses.

Within the study areas, the predominant adaptation strategies focused on biophysical adaptation. Fazey et al. (2010) argue that many adaptation strategies build short term coping capacity but ignore the possibility that such measures may have longer term detrimental impacts, often exacerbating vulnerability or undermining resilience. The results presented in this study are consistent with this view and show that focus has been primarily on building physical resilience but less on changing attitudes and perceptions. The use of the popular adaptation strategies is in part driven by the food aid tied to the interventions, and the implementation of such measures offers less room for farmer innovation and modification to fit local realities, thereby presenting costs to food security in the medium term. While some practices may be seen as consistent with a resilient farming system, the findings cast a doubt as to whether such measures, which often fail to take into account local values, culture and beliefs, and do not promote local innovation are indeed consistent with resilient farming systems. This also raises the issue as to whether refusal to adopt the so-called 'resilient practices' is actually indicative of farmer agency to challenge new knowledge and retain what they believes works better. In this case, agency is captured as a character of resilient households.

Chapter Six

The Influence of the Response Context on Resilience

6.1 Introduction

Chapter Five concluded that livelihood assets do not necessarily predict household resilience to drought and other stresses, but their role could be better understood by factoring in the context in which they are used. On this basis, this chapter seeks to explore the effect of the background context from the perspectives of institutional, policy, technological and market dimensions on the capacity to respond positively to stress. These four dimensions that describe the context are explored against a set of resilience surrogates namely stability, persistence, transformability, learning capacity, flexibility, self-sufficiency, recovery capacity and resistance identified in **Figure 2-1** in Chapter Two.

The first section of this chapter describes the schematic model showing the linkages between the context and the resilience surrogates. Section two concentrates on describing the context in relation to each of the selected resilience surrogates and seeks to show how resilience to drought is promoted or diminished under different contexts. The third section summarises the key issues and provides a conclusion.

6.2 Schematic model for analysing the effect of context on drought response

The dimensions that provide a description of the context were identified from quantitative and qualitative study findings. For the quantitative component, respondents were asked to identify the factor that they perceived as most important for enabling drought response. The following six emerged as the most important overall.

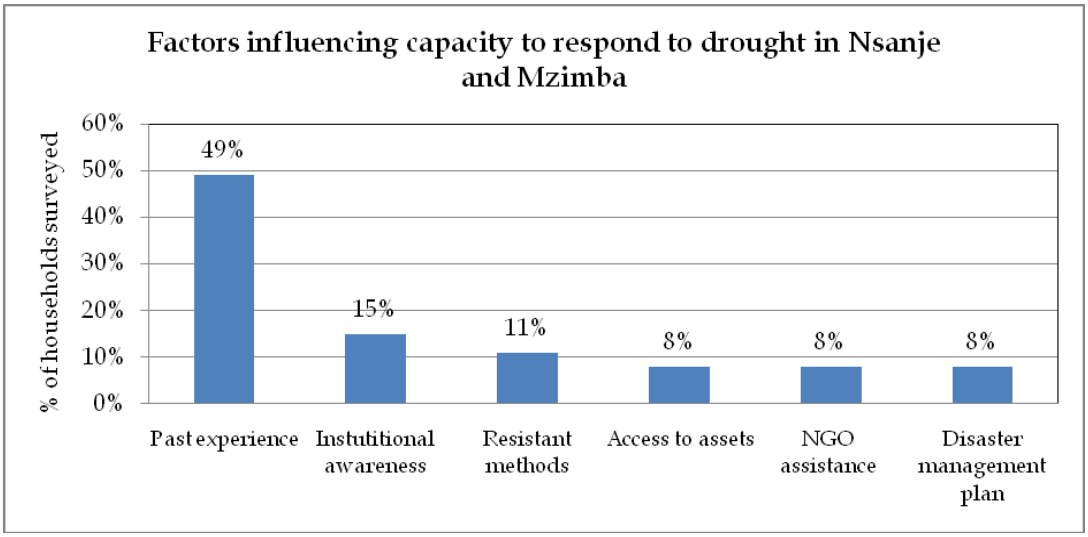


Figure 6-1: Percentage of households citing factor as most important in determining response capacity

Source: Author, 2012

Figure 6-1 shows that, consistent with the conclusion of Chapter Five, only 8% of respondents felt that assets were the key in influencing a household's capacity to respond. Past coping experiences were identified by 49% of respondents as the most important determinant given its influence on learning and on the coping resource base. Some 15% of respondents cited awareness of institutions and organisations from which resources for coping could be sourced as most vital, while 11% argued that use of stress resistant technology was the most important factor. The existence of an NGO

providing social protection as well as the presence of a village-level disaster management strategy were also rated as the most important factor by some in influencing household capacity to cope with drought.

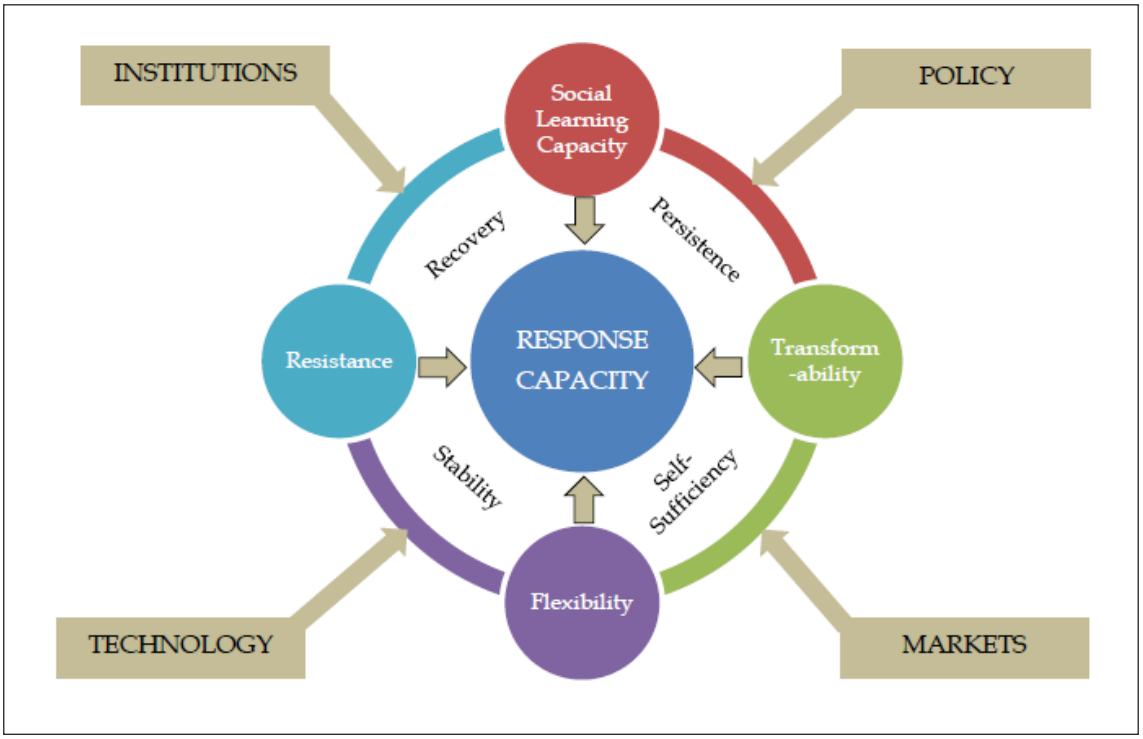
Thematic analysis of qualitative data identified twenty factors which when combined with the six described above, could be organised across four key themes of institutions, markets, policies and technology, as shown in **Figure 6-2**.

Source: Author, 2012

Figure 6-2: Factors influencing household responses to drought

These four dimensions of the study context were also consistent with the Sustainable Livelihoods Framework (SLF), a key component of the primary model on which this thesis is based. The SLF suggests that policies, institutions, organisations, legislation and processes are important in determining the success of livelihoods. Markets and technology, in particular, were incorporated on the basis of their relevance to livelihoods and drought coping in the study areas.

Four attributes of resilient systems (social learning capacity, flexibility, transformability and resistance) were considered for the analysis on the basis that these attributes have received less attention in the literature on resilience in food systems and, generally, they appeared more primary while the others (recovery, stability self-sufficiency and persistence) were more diffuse and cross-cutting. In addition, persistence and stability were identified in Chapter Two as attributes more ideal for analysing resilience in strictly ecological systems (**Figure 6-3**).



Source: Author, 2012

Figure 6-3: Determinants of livelihood and food system response capacity to drought

The schematic model in **Figure 6-3** suggests that by describing the context of the study area in terms of how resistant, flexible, transformable and capable of learning its institutions, markets, policies and technologies are, we can better understand the medium and long term resilience of a particular population group.

6.3 Determinants of response to drought

This section uses the attributes of resilient systems to describe how the institutional, market, policy and technological context of the study area contribute to an understanding of the processes and structures at play in the production of resilience to drought and other stressors.

6.3.1 Institutions

Institutions form the basis of this chapter since policies, markets and technology are all embedded within them. They have been separated here for the purpose of clarifying their prime constituents which would otherwise be less obvious if tackled within the single term of institutions. In the context of this study, institutions have been defined after North (1994: 360) as "…humanly devised constraints that structure human interaction. They are made up of formal constraints (rules, laws, and constitutions), informal constraints (norms of behaviour, conventions, and self-imposed codes of conduct) and their enforcement characteristics". The contribution of institutions to resilience, and hence maintenance of food security, was analysed by describing their social learning capacity, flexibility, transformability and resistance. As highlighted earlier, the other attributes were also incorporated into the analysis.

6.3.1.1 Social learning capacity

The capacity of institutions to learn from experience and produce responses consistent with resilient food systems was analysed around the following themes:

(1) Effect of experiences of stress on learning and adaptive behaviour

The results of the study showed that experiences of drought and other stresses initiated behavioural changes which promoted or undermined

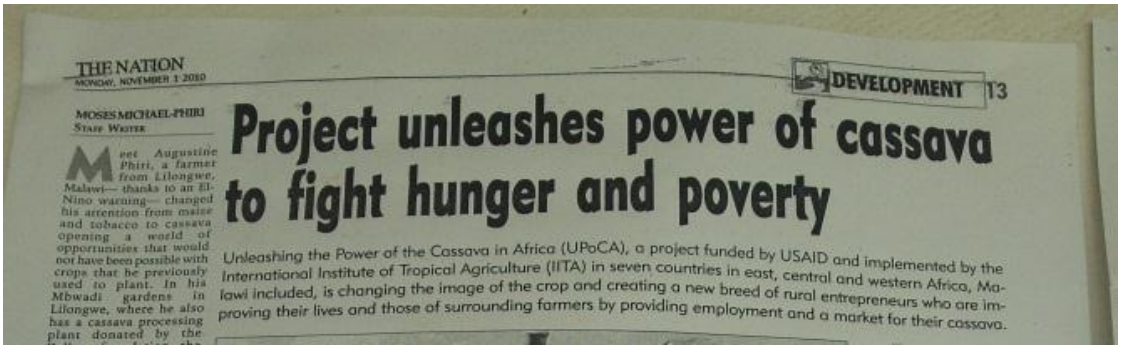
coping and adaptive behaviour. The 2001 and 2005 drought-induced food crises were reported as having altered individual and community level attitudes and preferences especially with respect to cassava. In Mzimba, respondents reported an increase in cassava consumption as the main meal, particularly among the lower socioeconomic classes, and as a reserve food crop for the middle and higher socioeconomic groups.

> *"In the past we did not consider cassava as food. Those who grew it did so for sale. However, because of that drought (2001) we now know that cassava is food. We now have it as nsima, I never imagined that happening".*
>
> Livingstone Mvula*, Focus group discussion, Mzimba

> *"Since the 2001 drought we have seen more farmers planting sweet potatoes and cassava, they have also started planting more trees and constructing marker ridges for conserving water".*
>
> Edward Gonani*, Agricultural Extension Officer, Nsanje

The quote above indicates that public perception of cassava as a food has improved as reflected in the use of cassava an additive to maize flour, consumption as a snack and use as a reserve food crop. Particularly in Nsanje, extension officers reported an increase in land allocated to cassava by farmers after the recent droughts. As exemplified in the transcript of interviews with Livingstone Mvula and Edward Gonani, cassava was previously considered a poor man's crop. However, after observing that cassava-growing households had suffered less from the 2001 and 2005 food crises, even the more affluent households were seen to start growing and consuming cassava.

The evidence presented suggests that experience of stress can stimulate attitudinal changes necessary for alternative coping strategies to be taken up. In this case, respondents demonstrated learning from others' experiences.



THE NATION
MONDAY, NOVEMBER 1 2010

DEVELOPMENT 13

MOSES MICHAEL-PHIRI
STAFF WRITER

Project unleashes power of cassava to fight hunger and poverty

Meet Augustine Phiri, a farmer from Lilongwe, Malawi— thanks to an El-Nino warning— changed his attention from maize and tobacco to cassava opening a world of opportunities that would not have been possible with crops that he previously used to plant. In his Mbwadi gardens in Lilongwe, where he also has a cassava processing plant donated by the

Unleashing the Power of the Cassava in Africa (UPoCA), a project funded by USAID and implemented by the International Institute of Tropical Agriculture (IITA) in seven countries in east, central and western Africa, Malawi included, is changing the image of the crop and creating a new breed of rural entrepreneurs who are improving their lives and those of surrounding farmers by providing employment and a market for their cassava.

Figure 6-4: Cassava promoted as a food and cash crop

IITA

BULLETIN

El Niño sets farmer on path to cassava

Figure 6-5: Drought has motivated farmers to venture into cassava

Figures 6-4 and **6-5** are images taken from The Nation (1st November, 2010) and the International Institute for Tropical Agriculture (IITA) newsletter (Issue No. 2041, 1-5 November, 2010). These images depict the growing importance of cassava as a food and income crop, as well as the influence of drought in shaping this change. **Figure 6-6** shows a trader selling cassava at a market in Mzimba.

Figure 6-6: Trader selling cassava at a market in Mzimba

However, despite the recognition that cassava outperforms maize and other staples in terms of drought survival and postharvest storage life, some respondents interviewed reported that shortage of cassava planting material meant that the valuable lesson learned, regarding the benefit of growing cassava as a food security crop, was of no economic value to as many households as was required due to failure to secure planting material. Inadequate access to planting material was also cited for sweet potatoes, a crop favoured for winter production following flood recession in Nsanje or on wetlands in Mzimba. Security of planting stock was largely constrained by the absence of growers of vines of sweet potato. This meant that households growing sweet potatoes were dependent on recycling the planting material they already had, most of which had already depreciated in quality due to accumulation of pests and diseases.

Beyond cassava and sweet potato production, the failure to adjust farming decisions given past learning was also reported for seasonal forecasts where

respondents argued that poverty constrained their ability to respond to given climate information. For example, a prediction of short season length required purchasing of short season hybrid maize or sorghum. However, the study also noted that there were some adjustments that were possible even without additional financial costs. These included delaying planting to reduce the effects of dry spells; avoiding fertiliser to minimise the risk of crop burning or delaying planting until after floods had receded in the case of flooding in Nsanje.

In contrast to the evidence of missed opportunities for effective learning, the study also identified cases where individuals and communities had managed to take advantage of lessons learned and past experiences to re-engineer individual and collective behaviour for managing food systems in the context of droughts and other stressors. Qualitative interviews conducted in both districts captured the following views on social learning capacity and response capacity:

> Author:"*Given that this area experiences frequent droughts and floods, are there any lessons that you have learned, and changes that you have made to your farming practices as a result of such learning?"*
> Charity Mbwanda:"*As for drought we have switched to early maturing varieties, or hybrid seeds and wedo more irrigation-based farming now. In terms of flooding, we are afforesting all areas where we can manage. "*
> Charity Mbwanda*, Focus group discussion, Nsanje

> Author:"*How did the disaster management committee come about?"*
> Luka Phiri:"*We experienced problems, especially floods, so this led us to have an idea to have this monitoring committee. This committee monitors the water level and when it reaches a certain critical level, it alerts all villages on what is about to happen. Sometimes a drum or whistles are sounded so that everyone in the village is made aware of what is about to happen. Since we all*

know that flooding is our main problem in this area, everyone knows we have to run to the safe places".

Luka Phiri*, Focus group discussion, Nsanje

Author: "*Are droughts now any different from droughts in the past?"*
Amon Mvula: "*Yes, they are. Irrigation farming has eased the situation* (making droughts now less severe)*".*

Amon Mvula*, Focus group discussion, Mzimba

Author: "*Are there any adjustments to your farming that you have made based on your experience of the climate here?"*
John Major: "*Floods used to destroy our crops and leave us poor and hungry. Now we take advantage of the floods, we wait until they have receded and then go in with seed and some fertiliser".* John Major*, Focus group discussion, Nsanje

Author: *"Is there evidence of learning? Are people doing things differently following their experiences with floods?"*
Grey Makonde: "*Yes. They now know which crops to plant after flooding, and which ones work well in dry seasons, like short season crops".*

Grey Makonde, Key informant interview,Nsanje

Each of the five responses captured emphasised different perspectives of the influence of learning on institutional capacity to cope with drought and other stresses. Charity Mbwanda and Grey Makonde emphasised the existence of alternatives in talking about 'switching', a characteristic which appeared more consistent with households in the middle and high socioeconomic classes. Poorer households were identified as often dependent on what was available rather than what they could choose given their narrower coping resource base. The 'permanent' shift to short season varieties, although ideal in typical short seasons, limited the possible yield that could otherwise have been achieved had long season varieties been used in a good season. The approach to drought appears to be adaptation based, while flooding was tackled from a mitigation approach.

Luka Phiri's response showed that the experience of climate extremes such as floods had the effect of creating new institutions, such as the disaster management committees. Importantly, local level social organisation was aided by other existing institutions operating at community and district levels, including local village heads, chiefs, NGOs and government departments. However, particularly for Nsanje, communities were organised for responses towards floods but with no focus on droughts. Droughts were seen as a problem for which household level responses were required, while floods were perceived as a communal problem given that everyone was equally affected. Despite households learning to take advantage of floods, this option was only available to a few households as discussed in Chapter Five. A substantial proportion of households with no access to wetlands or irrigated plots suffered disproportionately more from floods as they lacked the capacity to recover and did not benefit from flood recession-based, winter irrigation.

Institutions at higher levels also faced challenges in translating lessons learned into practice. It is argued that while the government's agricultural focus had shifted from specialisation in maize and tobacco, experiences of food insecurity and global market uncertainty had directed more attention towards diversification of agriculture. A key informant in the international agricultural research sector remarked:

> *"Yes, before it was all about maize and tobacco, now they are talking about diversification. When it is politically declared then it's the will of the government, but who should implement (that will)? This only means that people are allowed to look for funding to do diversification. When it's said, the government does not have a fund it means that stakeholders like us have to make things happen. The policy is there, and on paper it can resolve the food situation, but there is no money".*
>
> Paul Tembo* Key Informant Interview, Lilongwe

Paul Tembo argued that learning at national government level served the purpose of determining the policy direction, but the government relied on other actors to implement the necessary actions. A number of key informants interviewed argued that the government's high dependence on donors to implement adaptation strategies had a bearing on the extent to which sufficient adjustments in farming systems were made. While donors fund community projects, most of the supported interventions were implemented at the scale of the household with poor households being the primary target group. Moreover, donor support was seen as biased towards certain disasters such as floods, where donor impact could be clearly demonstrated.

An NGO project manager interviewed in Nsanje remarked that flood risk management was receiving more funding compared to drought management because the effects of drought were generally slow to manifest themselves and were not always visible. According to this respondent, donors were not very keen on funding drought related projects despite drought being a major issue. To cope with this, NGO staff were identifying

crops that were both flood and drought resistant and presenting them as flood resistant crops for funding.

> *"Donors are interested in making an impact, and floods allow them to do just that. You see, the difference is that floods have a clear visual effect, but not drought. So whenever there is a flood, donors quickly come in with tents, food and other things"*
>
> Jeffery Nyirenda, key informant interview, Nsanje

Another respondent in Nsanje lamented that floods were better in terms of attracting relief assistance than droughts. As a consequence, recovery from floods was seen as faster, especially where houses were not destroyed. The statement by Sandra Mandere reinforced a view that more human rights abuses were committed during drought years, rather than flood years, because the latter received more support:

> *"Floods are better because their effects are obvious to everyone, including government officials. The problem with drought is that one suffers in silence, behind closed doors".*
>
> Sandra Mandere, key informant interview, Nsanje

Thus, the goals of different actors and the level of flexibility possible within the rule- making processes had a bearing on the response capacity, and by translation, resilience outcomes.

(2) The influence of attitudes and different goals on willingness to learn

Based on attitudes towards drought and flood risk, two groups of respondents emerged from the qualitative analysis: the "victims" and the "victors". The "victims" believed that they required external assistance to cope and survive climate extremes, while the "victors" perceived droughts

and floods as a part life that they were supposed to confront with positivity or at least accept as fate. The latter group perceived availability of social protection mechanisms as a deterrent to willingness to learn and transform livelihoods. They argued that people knew what to do to reduce the impact of droughts or floods, but by knowing that even if they did nothing they would still survive through hand-outs, and thus they had no incentive for acting on existing knowledge and lessons learned. The sentiments expressed by the following statements were reiterated by several respondents in Nsanje:

> *"No one wants to depend on food aid forever. We want to be able to grow our own food. But it is not possible; we have droughts and floods every year. Yes, we still need NGOs here".*
>
> Thomas Maundi*, key informant interview, Nsanje

> *"It's not like we want to depend on hand-outs, but even when we grow crops they fail and we get nothing, so that means there should be a means to help us".*
>
> Johannes Ngoma*, Focus group discussion, Mzimba

> *"In Makhanga people are more receptive to development, in Nyachilenda people are always waiting for floods so they can get assistance".*
>
> Aleck Mbewe, Key informant interview, Nsanje

> *"Most of the farmers here at the floor are used to getting hand-outs while up there no-one provides any; they know that if they do not follow advice from extension workers there is nothing they can get. Here (at the floor) even if you don't listen to those guys you are assured you will get something from the NGOs. Another thing is that the people at the floor are fishermen, so they have a 'plan b'. They can sell fish and buy food".*
>
> Masauso Chimkango*, Key informant interview, Nsanje

> *"Again I think they*(people of Nsanje) *have been loved too much by the NGOs. For one to develop strategies, they must feel the impact. But you see every year there are bags of maize coming. That makes people lazy, so even if they do not farm, they know they will reap".*
>
> Patricia Lungu*, key informant interview, Nsanje

Thomas Maudi and Johannes Ngoma argued that dependency on food aid was not by choice; a number of factors including droughts and floods were constraining attainment of household food self-sufficiency and survival depended on food assistance. In contrast, Masauso Chimkango and Patricia Lungu argued that dependency on food aid was being driven by the fact that people knew that even when they had not planted anything, they would surely 'reap' through NGOs. This position was being reinforced by the rights based approach where, as argued by some staff in NGOs, communities had been empowered to demand accountability in food aid. They argued that people dependent on hand-outs would often show less willingness to be trained in farming techniques. Food aid was argued to have made people lazy and dependent. Aleck Mbewe's comment suggests that being seen as 'vulnerable' was being used by community members to influence access to food hand-outs from government and NGOs. He argued that a state of protracted relief and emergency were seen by some as desirable as it secured food through relief assistance. At village level, this implied that households that produced the least food were more likely to receive food aid than those with something. This was a disincentive for attending training or using new technologies aimed at boosting production (on the basis that production would not be large enough to meet needs, but substantial enough to warrantee exclusion from food aid beneficiary list). This worked as a disincentive to learning.

Key informants in government departments in both districts rated the non-NGO covered villages as more likely to achieve higher agricultural production and food security compared to those that were under social protection interventions. Some key informants in the NGO sector mentioned that their continued presence was dependent on the persistence of such needs, of which food security and sustainable livelihoods was a huge one. Further, some of the qualitative evidence suggests that an image of highly vulnerable populations may have been directly fuelled by self-interest on the part of NGO staff whose jobs depend on communities being 'vulnerable'.

> *"You know as people we also want work, so if I am working in an emergency organisation I want to keep my job and at times I will exaggerate the situation so that I can sustain my own livelihood as a professional. But this means neglecting other important elements, such as dealing with the real problems. You know, when you think about it, the amount of money that donors pour into emergencies is too much. If we were to put it into development, then the impact would be huge. If we could put that money into irrigation for example, we would be able to cover more than half the potential area that can be irrigated in Nsanje. But donors prefer to give people maize, that's what maintains dependency".*
>
> Sandra Mandere, key informant interview, Nsanje

According to Sandra Mandere, self-interest by staff in NGOs and donors reinforces dependency, and the best options may be foregone in the process. On the other hand, some aid-dependent communities may be less keen on learning or changing their current situation, from which they benefit through food aid, thereby maintaining a state of vulnerability.

There were opposing views with regards to the role of education in shaping attitudes towards learning at household and community level. The following exemplify these views:

"When you look at factors that make people vulnerable you need to consider education. Without education, without a certain level of education, the communities might not, what can I say, their adaptation levels may be hampered by the lack of education. In communities with low literacy rates like we have here, and you go to the community and say, because of this climate change we need to adapt, to grow fast maturing crops, I mean you go to them and try to articulate various measures to adapt, but because of this low level of education they may not appreciate, they resist to change".

Grey Makonde*, Key informant interview, Nsanje

"I don't think education matters in determining whether one uses these technologies or not. It's about what one feels they like, not education".

Kennedy Nyirenda*, key informant interview, Mzimba

Grey Makonde argued that lack of education impeded uptake of various adaptation measures as people would have low appreciation of the importance of issues, as a consequence of low literacy levels. In other words, people of low education attainment were perceived as more difficult to train. However, as shown in the previous chapter, training was on the basis of socioeconomic status rather than education, on the basis of pro-poor targeting. Kennedy Nyirenda contradicted this view by arguing that changing farming practices was influenced by individual level traits such as labour availability, attitude towards new technologies, perception of risk and adaptive capacity, among other factors. It was argued that farmers learn from other farmers, and from their own experiences. This notion was captured in the statement below:

"You know farmers after they have seen something they can easily change. Because in the past if you had told them to plant cassava and eat it, they would not have done that. That hunger changed their mind set".

Mautho Mvula*, key informant interview, Mzimba

(3) Learning as a social process

The current study did not identify any evidence of a collective review of experiences or planning for future risks associated with droughts at the community level. After each episode of drought or floods, there are no formal processes within communities for reviewing the quality of responses and drawing out lessons for shaping future responses. In Mzimba there were no disaster management committees even up to district council level where disasters are being handled by a Human Resources Officer. This absence of organisation was attributed to the perceived low incidence, low impact and high unpredictability of disasters, and hence the lower need for planned action; the existing strategy seemed to be reactionary rather than pro-active. An official at the District Assembly commented:

> Author:"*Is there a disaster preparedness plan in this district?"*
> J. Mkandawire:"*No, we don't have one here. I don't think we have. The reason is that it's not like in Nsanje here, here disasters are sudden, they come just like that so it's difficult to prepare. But at first when we met the DODMA*(Department for Disaster Management Affairs)*, they said that each district should have a disaster plan. We thought that we could have a place to store maize, blankets to help families that face problems. We thought like that, but as you know given our economic problems it's difficult to deal with these things".*
>
> J. Mkandawire, Key informant interview, Mzimba

The response from the district official indicates that financial capability to implement disaster preparedness was an issue in Mzimba. Further, preparedness planning was perceived as particularly challenging since the nature of the risks was not sufficiently known. The District Assembly had

been handling highly localised incidents such as fires and homes destroyed by winds.

In Nsanje a disaster management committee existed at all levels from village to district, and the focus was flooding. Early warning and early action strategies, including role plays to raise awareness of potential response options, was all confined to flood risk management. Droughts were not included in the disaster management plan; they were seen as individualised household shocks that could be dealt with at the individual household level, or through national government relief programmes. Discussions in Nsanje indicated that the slow-onset nature of drought impacts had the consequence that households suffered without being noticed, and the alarm could not easily be raised as a certain proportion of the village or EPA would still be coping well with the situation. By the time the better-coping households start facing serious constraints, the point when the alarm is raised, the weaker households would have suffered immensely. In contrast, floods affect every household at about the same time irrespective of wealth status, hence the motivation for collective action.

For drought the social learning process appeared more as a passive and informal process where farmers were learning through gossip, peeping over each other's fence or general conversation with neighbours. A difference was noted in the transmission channels for autonomous and planned adaptation

and coping strategies. Autonomous responses were mainly copied (by the rest of the village) from some local innovators and early adopters who could bring in new ways of doing things from other villages, districts or countries. This group of local innovators and early adopters consisted of households in the middle class, with some education and often with history of migration. In Mzimba, this group included farmers that took up dairy farming based on hybrids such as the Jersey as opposed to the common Malawi Zebu, and the sorghum producers. However, the failure of these enterprises could have the consequence of reducing desirability of engaging in similar livelihood activities among the other farmers in the local area.

Planned adaptation practices such as conservation farming, rainwater harvesting, and agricultural diversification, among others, was targeted at the poorest of the poor. Such poverty-based targeting of households excluded the innovators, who unfortunately were seen as less willing to learn from the poor. Technologies branded pro-poor were not readily diffused or appreciated as relevant to the higher socioeconomic groups. An agricultural extension officer interviewed in Mzimba offered this opinion:

> *"Some of them have not been so keen on the conservation farming, they say they heard it's meant for people without cattle, and because they have cattle then why should they use it. We are trying to demonstrate that it (conservation farming) could help them too, that is why we do demonstration plots, so that they can evaluate for themselves".*
>
> Mautho Mvula, Key informant interview, Mzimba

In Nsanje, however, conservation farming had been actively taken up by the middle and higher income groups. While the poor appear to prefer learning from their richer neighbours, the food aid component attached to some adaptation projects such as conservation farming ensures that promoted technologies are used, but this on its own is inadequate to confirm adoption in the longterm especially without the project. The "learning from the better off" pathway appeared to allow for technology assessment by individuals with higher risk absorbency, manifested by higher asset access.

(4) ***Organisation of social learning process and productivity***

Learning as an active process achieved through capacity building workshops at community level was widely seen as very important for building community and household productivity in agriculture. However, discussions with community members revealed that there was poor coordination of training and management of learning, especially the training provided through NGOs. In the two EPAs covered in Mzimba, concern was raised with regards to the different methods of doing the same thing (e.g. land preparation, seed placement and plant spacing, fertiliser application, etc) that farmers received from different trainers, leading to confusion and loss of trust in any of the many techniques for which training was offered.

In Mzimba, some farmers were hybridising these different techniques in a bid to capture the benefits of all. In one case examined closer, high planting density was preventing the farmer from weeding as the spacing

recommended had not taken into account the width of the blade on the hand-hoe. The fact that, as one respondent phrased it, "*everyone is trying to teach us something new*" raises potential questions on the transaction costs related to participation in the various community training events on livelihoods and food system activities. The transaction costs relate to the amount of time attending village meetings and training workshops for various NGO and government projects, time which could otherwise be directed towards other activities. Costs were also related to the failure of some of the promoted techniques or livelihood options, as discussed in the case of dairy farming and soya bean production in Mzimba. Nonetheless, these costs also provide valuable learning which reduces the possibility of similar losses in the future. The challenge lies with the informal nature of lesson learning where others may have misconceptions of what caused the project to fail and as such self-expose to economic harm.

6.3.1.2 Flexibility

The study identified institutional arrangements by way of informal and formal rules, regulations and norms that influenced the capacity of households to cope and adapt to drought. The key themes emerging in the analysis of flexibility of the livelihood and food system included the following:

(1) Flexibility of rules and coping range

The institutional arrangements as far as land access had elements of flexibility which had direct implications in protecting livelihoods from potential collapse in a drought or flood year. In the first instance, land could be accessed informally from households that either had large holdings, low land utilisation capacity or both, as reflected in the statements below:

> *"Since they are using the treadle pump, it is very difficult to grow crops over say two hectares or even one hectare of land. (So) they rent out the rest of the land they have, because it's too much work, too big to use. The only possible size to (fully) use is point one hectares, so the remaining land is rented out".*
>
> Edward Gonani*, Key informant interview, Nsanje

> *"Some people do not have land so they rent from those that have. It's like this, if my father owned land for irrigation, he would cut a piece for me. But if I did not want to use it then I would rent it out… the normal charge is about one thousand to one point five kwacha for a point one (0.1hectares).*
>
> Zocheza Bitoni*, Village development committee member, Nsanje

The challenge of inadequate capacity to utilise land due to insufficient irrigation technology, as cited by Edward Gonani, and availability of land driven by the need for cash income or lack of commitment (e.g. Zocheza Bitoni) created a stock of land that landless households could access. Payments for land could be made in-kind based on the harvest at the end of the season, or in cash. While cash payments could be negotiated between landlord and tenant, and generally averaged MWK1800 (£7.20) per season for an acre (0.4ha) of land, payment in-kind was often not expected if the farmer had failed to harvest anything due to shocks such as droughts, flood and pests. This meant that the tenants were socially protected.

The view offered by Gonani was reiterated by respondents in Mzimba. Emerging from the view that insufficient irrigation technology rendered some land available to the landless; a question of what impact improving treadle pump irrigation capacity would have on the availability of land for renting stands out as important for resilience thinking. However, in spite of these flexible arrangements, various bottlenecks relating to land access were identified such as the inflexible rules regarding use of rented land:

> *"When taking the land they (tenant) know they have land for one season. If they want to take up conservation farming or any other new technology they must consider that. Otherwise they may have to rent out land for five seasons, which is very rare".*
>
> Grey Makonde*, Key informant interview, Nsanje

Tenants were not allowed to modify the land they were leasing through use of tillage practices different from the landlord's. For example, tillage practices such as digging planting basins, ridging or digging pits for water harvesting would not be permitted by most landlords. In some cases tenants were not even allowed to grow a new type of crop on the leased land. Other landlords were comfortable with any use of the land as long as the practice was being promoted by the local extension officer. However, renting land for a single season meant that the medium and long term biophysical benefits of such technologies as conservation farming could not be realised for the implementing farmer.

(2) The effect of uniformity on innovation

Farmers working in group gardens were expected to follow the guidelines provided by the local agricultural extension officer in as far as crop choice and management practices. As a consequence there was very low variation in such practices as tillage practice, plant spacing and fertiliser application. This inflexibility may have contributed to the low level of farmer innovation into the various farming practices for which training had been provided. With conservation agriculture, for example, some of the respondents interviewed reported being unable to add in a legume crop into the maize mono-crop as that had not been covered in the training.

Livestock farmers in Mzimba, on the contrary, identified livestock as providing higher flexibility than cropping on the basis that it was easier to bring water to the animals than to crops. With increasing drought risk, therefore, livestock farming was proving more attractive as a livelihood source.

(3) Role of youth and women in innovation

The cultural system in both districts upholds that elders should be revered and therefore their views cannot be openly challenged or questioned. Youth interviewed in focus groups in Nsanje reported that their views regarding farming practices were often not taken into account at the household level. In Mzimba, youth felt that their lack of land access (land is mainly owned through inheritance from parents), deprived them of an opportunity to try

new crops and farming technologies that their parents were less willing to experiment with. Regardless, pressing on new ideas had the risk of being blamed for food shortage should the new practice fail to deliver.

The study tested whether younger farmers were more innovative than older counterparts. As a proxy, the use of drought management techniques and various agronomic practices was tested across age groups (**Table 6-1)**.

Table 6-1: Effect of age of household head on use of drought management strategies

Drought management technique	N	Age of Household head			Total	Chi Sq.	DF	P value
		19-35yrs	36-55yrs	56yrs +				
Conservation tillage	195	56.0%	49.3%	55.3%	53.3%	0.713	2	0.700
Treatment of stover	195	44.0%	23.2%	26.3%	29.7%	6.709	2	0.035*
Legume incorporation	195	68.0%	34.8%	42.1%	46.2%	13.693	2	0.001**
Water harvesting	194	38.0%	22.1%	22.1%	25.8%	5.283	2	0.071
Winter ploughing	194	60.0%	44.9%	44.0%	48.5%	3.608	2	0.165
Crop rotation	195	80.0%	56.5%	56.6%	62.6%	8.728	2	0.013*
Seasonal forecast use	190	72.0%	60.0%	66.7%	65.8%	1.851	2	0.396

Source: Author, 2012

The results tabulated (**Table 6-1**) shows that there was no significant difference in use of drought and production management techniques between farmers of different ages for four of the seven strategies considered. Younger farmers were more likely to treat stover with urea prior to feeding livestock, incorporate legumes into the soil and rotate crops. Techniques such as conservation farming, water harvesting, winter ploughing and seasonal forecasts use did not show any significant difference with age possibly owing to the fact that these technologies were being promoted for farmers of all age cohorts

Employed youth and those working in urban or international locations were regarded differently by parents and given leeway to contribute to farm

decision making. Some of these youth contributed to the household economy through providing seed and fertiliser, as well as cash for hiring labour. The age effect on household farm decision making appeared different for younger household members However, household members that had migrated to urban areas or international destinations were seen as having higher capacity to contribute to farm decision making as they were often an integral source of improved seed, fertiliser and cash for payment of labourers.

In addition to the youth, women were perceived by both government and NGO staff as socially excluded in the household decision making process. A key informant in Mzimba offered the following opinion:

> *"The voice of the youth and the women is also coming up as a big problem. Because of the culture here, most of the committees are dominated by people who are thirty and above because, traditionally, the younger ones are supposed to remain silent, they are not in decision making committees. You will find that people who are forty, fifty, sixty and above are the ones doing the talking, the youth are supposed to remain silent".* Esikomu Nyirenda*, Key informant interview, Mzimba

> *"Women do not own land in Mzimba and at death or divorce they return to their homes landless. They are like visitors and do not have much say in meetings. You have got men who are the owners of the village and women who are added on, who are married to the village".* Kennedy Nyirenda*, key informant interview, Mzimba

Esikomu and Kennedy Nyirenda concur that local institutions were suppressing women and preventing their contribution into decision making. Committees were seen as comprised of older males with youth and women expected to remain silent in meetings and not included in the decision making committees. At household level, however, the results presented in **Table 6-2** refute this idea, suggesting that women were also involved in

decision making. It was argued that silence did not mean lack of voice as women indirectly expressed their interests through their husbands or close relatives. In fact in some of the mixed focus group discussions (FGDs) conducted in Mzimba women appeared to dominate discussions, a sharp contrast to the projected image of vulnerability and powerlessness.

Table 6-2: Gender of decision maker at household level

			Gender of farm decision maker at household level						
		N					Chi-sq	DF	P-value
			Male	Female	Joint	Total			
District	Nsanje	99	40.4%	27.3%	32.3%	100.0%	1.227	2	0.528
	Mzimba	95	32.6%	31.6%	35.8%	100.0%			
Total		194	36.6%	29.4%	34.0%	100.0%			

Source: Author, 2012

In Mzimba the study identified gender differences in the management of cropping systems. For example, men were responsible for tobacco cultivation while women took care of food crops like maize and cassava. In households where women are involved in tobacco farming they often grew the so-called "feminine tobacco", oriental, since the stronger and more masculine tobacco, burley, was grown by males. Burley tobacco enjoyed the government minimum price guarantees (set at US$2/kg in the 2010 season) and generally had a higher market price than oriental tobacco. However, female respondents reported that income from tobacco farming was driving alcoholism among most of the rural men, leading to income loss and reduced shock coping capacity. It was reported that after receiving cash income for tobacco, some men would literally disappear only to re-emerge with all the money gone a few days or weeks later. In fact it was also argued that

widowed or single women growing tobacco were better off in terms of farm income than their married counterparts even when labour constraints faced by the former were factored in.

6.3.1.3 Transformability

(1) Changes in livelihood sources

The study identified drought as one of the main factors that had caused changes in the main source of livelihood pursued by households. 22.5% of all households interviewed had changed their main sources of livelihood within the ten years prior to the study. Of the 44 cases observed, 28 were in Mzimba and 16 in Nsanje. **Table 6-3** summarises the main drivers of livelihood change.

Table 6-3: Main factors driving change in main livelihood

	District				
	Nsanje	Mzimba	Total	Chi square	P value
N	16	28	44		
Experience of drought	56.2%	17.9%	31.8%	6.918	0.009**
Loss of regular employment	6.2%	25.0%	18.2%	2.406	0.910
Death of household head	12.5%	14.3%	13.6%	0.028	0.868
Other	6.2%	14.3%	11.4%	0.653	0.419
Reduction in income or profitability	†	14.3%	9.1%	2.514	0.113
End of regular remittances	6.2%	7.1%	6.8%	0.013	0.910
Experience of floods	6.2%	3.6%	4.5%	0.168	0.682
Theft of property or asset	6.2%	†	2.3%	1.791	0.181
New skills or opportunity available	†	3.6%	2.3%	0.585	0.444
	100.0%	100.0%	100.0%		

Source: Author, 2012

Table 6-3 identifies drought as the most important (31.8%) accounting for almost twice as much numbers as the second most important driver. The

influence of drought was significantly higher in Nsanje (56.2%), due to its higher exposure, sensitivity and hence level of impact, than Mzimba (17.9%). In fact, drought was the only shock whose impact on livelihood change was significantly different for the two districts.

Loss of employment and death of a household member, affecting 18.2% and 13.6% of all cases, are financial and human asset shocks which undermined capacity to generate a cash or food equivalent income. Similarly, reduction in income or benefit from existing enterprise, cessation of social protection measures such as remittances, and experience of shocks like flooding and theft of livelihood asset all reduced livelihood viability thereby necessitating transformation to new sources or scaling up on those that previously had lower importance. In 2.3% of cases, the acquisition of a new skill promoted a change in main livelihood pursued.

(2) Dependency on aid

Respondents in Nsanje have had a long history of receiving disaster relief, food aid and general development assistance and several key informants argued that dependency on aid was stalling willingness to transform their livelihoods despite losing to successive climatic extremes. Perceptions held by some of the key informants indicated that after years of guaranteed aid, some households had become so used to receiving aid that they had no incentive for moving from dependency to production and self-reliance. In

some interviews, it was argued that being classified and identified as a vulnerable household was such an attraction as people knew they could access food without doing any work at all.

A development expert interviewed in Lilongwe commented that livelihoods could only be transformed if individuals and communities "achieved a state of dissatisfaction with their current situation". Social protection mechanisms through rights-based programming were seen as tending to reduce opportunities for transformation.

> *"The government is not creating the right environment for people to respond. I think there is too much external assistance and that doesn't give an opportunity for the community to change and deal with the situation. The community should become dissatisfied with that situation; if you are satisfied you do not change your situation. The floods at the moment have more benefits than costs, so people do not move, they stay there…they are satisfied with the current situation. They stay like that".*
>
> Mr. Stephen Mkandawire, Development Consultant, Lilongwe

A village head interviewed in Nsanje argued that aid had created a culture of laziness and this laziness was undermining the willingness of communities to adopt new technologies and to improve crop and livestock performance. In fact, his sentiments were supported by some key informants who felt that some form of suspension of aid was necessary to allow for livelihood transformation towards more sustainable solutions:

> *"If people were left alone, of course that's a human rights issue, but they would learn. They would change".*
>
> Interview with village head John Mvula in Vibangalala, Mzimba

Education influences attitudes to learning, as well as transformability. Others argued that educated people still behaved like village people, since they believed in the same thing. Decisions to take up new technology had nothing to do with education, except where the respondent had a history of training in agriculture.

There was also a perspective that educational attainment influenced peoples' attitude towards learning in the context of coping and adapting to drought, as well as general improvements in agricultural production. According to Jeffery Nyirenda, educated people were more receptive to new ideas. However, this should not mean that the values or knowledge held by the uneducated were inferior and had to be discarded. According to Mr. Nyirenda:

> *"When you look at factors that make people vulnerable you need to consider education. Without education, without a certain level of education, the communities might not, what can I say, their adaptation levels may be hampered by the lack of education. In communities with low literacy rates like we have here, and you go to the community and say, because of this climate change we need to adapt, to grow fast maturing crops, I mean you go to them and try to articulate various measures to adapt, but because of this low level of education they may not appreciate, they resist to change".*
>
> Jeffery Nyirenda, Key informant interview, Nsanje

6.3.1.4 Resistance

(1) Effect of local leaders as gatekeepers

Local leaders, including chiefs, village heads, traditional healers, and the elderly are perceived as custodians of "local culture" and knowledge and, therefore, seen as elements of resistance to social changes, including those relating to agriculture. The programming of development assistance and

indeed disaster risk reduction has attempted to bridge this gap by emphasising the need for harmonising the western technology with local knowledge. For example, communities are being encouraged to use traditional climate forecast indicators which, are less known and not entirely trusted within the communities. Moreover, the traditional seasonal forecast indicators appear to emphasise the prediction of within season level of rainfall,. Since they do not produce forecasts prior to the season, they are of less value in preparedness planning. However, this encouragement of use of traditional forecasts makes it easier to convince communities to start using scientific seasonal forecasts.

If local leaders are seen as barriers to change, the approach is to "convert" them so that resistance is overcome and new technologies and knowledge is acceptable. One staff member in an NGO interviewed in Mzimba, and reiterated by other NGO staff in Nsanje remarked:

> *"Chiefs here are very strong. When you have won the village headman you have won the whole village. You simply need to convert the village leader and the leader will do everything because people listen to them. They have the influence, they can be heard. When they talk the villagers stop. So there is benefit if one can take advantage of their power".* John Banda*, NGO Programme Manager, Mzimba

Community entry through chiefs and village heads appears to take away the power of these leaders to question the motivations and impacts of any assistance, with the fear that should the assistance be withdrawn, then the communities they serve would blame them, hence threatening their hold on to power.

> *"If you say no to a project and the community gets to know that it's you that refused assistance, then you will always be blamed whenever same problems come up".*
>
> Jamu Mangoma* Interview with village headman in Makhanga, Nsanje

By using village leaders as the entry point and the focus of participation, power is concentrated in some quarters and democratic participation is hindered, leading to fixes that fail to tackle communal problems. When projects are hijacked by the elite, the rest of the community may fail to express their concerns on the constraints the project imposes on them. The loss of capacity to participate in decision making, or to resist what is seen as irrelevant or undesirable, implies a loss of agency and has the effect of exposing communities to new stresses to which they have limited knowledge and coping capacity. Reinforcing this was the linkage of food aid with developmental projects, where communities may have felt obliged to agree with the project team so as to ensure access to food.

An example of such a case was conservation farming technology. Farmers practising conservation farming were advised to keep the maize stover on their fields. Traditionally, the stover is communal and is grazed by cattle irrespective of owner. The poor households benefit from the cattle owners through milk and meat, or draught power. However, by protecting their stover with the project, the communal exchanges were severed. In the long term this may have implications on the feasibility of cattle keeping, since stover forms a large component of the livestock feed. The non-cattle owners were aware of this loss for their cattle-owning neighbours, but because the

project required a set of changes including keeping stover, by so complying they relinquished their ability to prioritise other benefits, in favour of the seed and fertiliser brought by the project.

(2) Low cultural resistance, trust and response

The erosion of trust in traditional beliefs is seen as having produced mixed outcomes for communities in the study areas. Where community members were able to identify some traditional indicators for seasonal climate forecasting, they were unable to physically identify some of the particular tree species used for such forecasts because these trees have been lost from the local landscape for firewood or fencing material. It may be expected that in a balanced system, those species that provide early warning information would be protected by a set of regulations to ensure that the service generated from them is continued. Thus low cultural resistance weakens application of knowledge creating ecological losses that have implications for human survival.

In Nsanje a traditionally held belief that Mbona, a spirit medium, blesses fields to ensure a good harvest is now less considered by many households in the surveyed communities. The belief states that since Mbona cannot walk across terraced fields (e.g. tied ridges, conservation farming planting basins) she is not able to bless such fields and yields may, as a result, be expected to be low. Many farmers have adopted use of tied ridges even for fields on flat land. This has led to increased exposure to flood risk resulting in crop loss.

While the belief itself may not be tested, the informal regulation contained therein sought to emphasise that land modifications such as tied ridges were inappropriate in those areas where the belief was known. On typical dry years, however, proponents of the use of tied ridges argued that the benefit in terms of water harvesting made substantial effect on crop production.

Trust or lack thereof, emerged as an important theme in as far as use of climate forecasts was concerned. Use of seasonal forecasts by farmers was found to be significantly higher in Mzimba relative to Nsanje. As shown in **Table 6-4**, although there was no difference in the perception of the usefulness of the forecast among users in either district. In Nsanje, the low use of forecasts was associated with the perception of high frequency of inaccurate predictions in the past. Respondents in Nsanje perceived the local climate as volatile and difficult to predict.

Table 6-4: Use of seasonal forecasts and perceived value in Nsanje and Mzimba

	Ever used forecast?	Used forecast last season?	Found forecast useful?
Nsanje	61.6% (n=99)	56.7% (n=97)	83.3% (n=66)
Mzimba	78.7% (n=94)	75.3% (n=93)	89.9% (n=79)
Pearson Chi-Square	6.713	7.273	1.351
DF	1	1	1
P-value	0.010	0.007**	0.245

Source: Author, 2012

Table 6-5 shows that while a substantially higher proportion of respondents in Nsanje relied on the radio forecast (78.6%) than any other source, in Mzimba the local ADO was the main source (50.6%), despite the fact that the radio forecast was also very important in Mzimba, accounting for 46.8% of

all cases. In Mzimba, the ADO officer was a more trusted source of climate forecast information as he could tailor make and package the message down to the village level. These two tables suggest that, among other factors, receiving seasonal forecasts from a trusted source such as a locally based ADO increased usage of such forecasts.

Table 6-5: Main source of seasonal forecast used in Nsanje and Mzimba in the 2009/2010 season

		Source of seasonal forecast			
	N	Radio broadcast	Local extension officer	Neighbour	Disaster mgt committee
Nsanje	56	78.6%	10.7%	3.6%	7.1%
Mzimba	77	46.8%	50.6%	2.6%	0.0%
Total	133	60.2%	33.8%	3.0%	3.0%

Source: Author, 2012

Given the forecast information, households typically changed the variety of crop (47.1%) e.g. choosing short season maize where a short season was expected; or the choice of crop to plant (45.5%) e.g. favouring sorghum or cassava ahead of maize in a typical dry year. Reducing food consumption and purchasing food for storage were some of the measures taken by households in response to the seasonal forecast (**Table 6-6**).

Table 6-6: Main decision made given seasonal forecast information

		Decision made given forecast information					
	N	Changed choice of crop	Changed variety of crop	Purchased more food for storage	Altered size of the field used	Moved to higher ground	Reduced consumption earlier
Nsanje	51	56.9%	37.3%	.0%	.0%	3.9%	2.0%
Mzimba	70	37.1%	54.3%	2.9%	1.4%	.0%	4.3%
Total	121	45.5%	47.1%	1.7%	.8%	1.7%	3.3%

Source: Author, 2012

In Mzimba, the slightly higher level of trust in the seasonal forecast, as shown by usage, may have been associated with the lower incidence of droughts and dry spells, and hence fewer cases of incorrect forecasts. In Nsanje, on the contrary, extension officers reported that the forecasts they received from the Department of Climate Change and Meteorological Services were often not accurate and increasingly they were reluctant to pass the messages to farmers or to give them recommendations on what to do, but rather encouraged the farmers to make their own decisions than risk being blamed for giving costly advice.

> *"At first we used to tell farmers when to start planting and what seed to use. But now we have observed that this thing called climate change makes it difficult to give the farmers accurate information. At first people used to plant by the 17th to 20th of October, but now it's around 15th to 20th November. Now as you see, the rains are often not enough to plant. We just tell the farmer to assess, to ask themselves "is there enough moisture to plant"- we don't tell the farmer, it's like an open ended thing. There is nothing like on such a day you can plant".*
>
> Aleck Mbewe, Key informant interview, Nsanje

> *"There was a Mr Smith (a meteorologist) who used to say; 'The rains will come on the 15th of November', and they would come without fail. This time around it is difficult to judge when it (rainfall) is coming. This gives no real picture for a farmer to plan his crops. Previously you knew when to plant your seeds, this time it's unpredictable. You just wait and see".*
>
> Amon Mvula, Focus group discussions, Mzimba

The responses from Aleck Mbewe and Amon Mvula are both indicative of a perceived decrease in both season length and rainfall predictability. As shown in **Table 6-7,** respondents in the study areas perceived that a number of changes in the local climate had occurred, some of which included increased unpredictability of rainfall e.g. false starts to season or delayed season start. Poor rainfall predictability was seen as a likely source of

mistrust of advice from extension officers. To prevent blame on inaccurate forecasts being apportioned to them, extension officers were transferring the responsibility of assessing the drought and flood risk to the farmers and communities at large. Data from the field (**Table 6-7**) shows the respondents' perceptions of the most significant changes in climate.

Table 6-7 : Most significant change in climate observed by respondents

		District		Total
		Nsanje	Mzimba	
N		97	91	188
Most significant change observed	Increased drought frequency	70.1%	50.5%	60.6%
	Reduced drought frequency	12.4%	4.4%	8.5%
	Increased flooding	8.2%	0%	4.3%
	Delay in season start	4.1%	30.8%	17.0%
	Frequent false start to season	3.1%	9.9%	6.4%
	Unusually warmer	0%	2.2%	1.1%
	Unusually cooler/colder	0%	2.2%	1.1%
	Good start to season	2.1%	0%	1.1%
Total		100.0%	100.0%	100.0%

Source: Author, 2011

The most significant change in climate observed in both Nsanje and Mzimba was the increased frequency of droughts, reported by 60.6% of all respondents interviewed. The proportion of respondents identifying increased drought frequency as the main change observed was significantly higher in Nsanje (70.1%) compared to Mzimba (50.5%). This finding was consistent with results from qualitative and secondary data analysis which showed higher drought frequency and impact in Nsanje than Mzimba.

6.3.2 Market

The market as an institution within which different parties exchange goods and services was considered in terms of characteristics such as learning

capacity, flexibility, transformability and resistance, which had influence on ability of households to cope and adapt to droughts and other stresses.

6.3.2.1 Social learning

Evidence of social learning from the study areas was based on how farmers and traders adjusted to or following experiences of market shocks and stresses. In Mzimba the experiences of failure to market soya bean and milk from NGO backed projects had served as a lesson for both the implementing agencies and communities.

> *"I will start with the marketing. What we have seen is that in the past we have helped communities to produce crops and livestock products but marketing has been the big challenge. Like last year in some of the areas, like the Mpherembe area, we had close to thirty metric tonnes of soya for over a year that we failed to sell. The farmers actually had to sell the soya at a cost much lower than the production cost just to get rid of it. We also had another area, Mutendere area, which processed the soya into soya flour for nutrition for under five undernourished children. But they failed to sell the soya because they did not have a name; you have to be known and reputable to sell. So marketing is a big challenge. For dairy cows that we have distributed, people have to cycle from Mutendere to the Boma to sell milk because locally there is no good market. What they asked us to do for the dairy cow project is for us to help me construct a cooling system so that they can store the milk. It is very difficult for community to do collective marketing because after producing the buyers offer them very low prices".*
>
> Kennedy Nyirenda*, key informant interview, Mzimba

Kennedy Nyirenda's analysis of the market challenges associated with the soya bean and dairy markets indicates that the experience of failure to market product had provided important lessons for moving forward. For example, he identifies the need for branding, establishing transport and market linkages as vital. However, some key informants were concerned that farmers lacked a business-oriented approach to farming. Instead treating

farming as a way of life and therefore making decisions which were seen as likely to undermine viability of the production system.

> *"What we are saying to the farmers is, don't sell your animals when you are desperate, prepare for eventualities. So we are training them on how to grow pastures and fatten animals before they sell them. Our idea is, farmers must always have cash, so they need to have savings in the bank".*
>
> Sylvester Ngoma, Key informant interview, Mzimba

Sylvester Ngoma was employed as a Project Manager for a community based organisation that was working on improving livestock husbandry practices in Mzimba. He reported that the focus on providing training in livestock management was based on the observation that local farmers were selling their livestock as and when they required cash and, as a result, they were getting very little money, compared to the alternative where the livestock would have been fattened.

In Nsanje maize traders interviewed reported that they had developed a system for monitoring food prices in Nsanje based on historical experiences of food shortage. For example, relatives and friends in Nsanje would periodically send text messages updating traders on local food prices. A price beyond MWK50 was seen as indicative of local food shortage and prompted traders to move in with their stocks. Such an arrangement was indicative of strong market integration in the Southern region and provided a mechanism for boosting local food supplies and thus maintaining prices within an affordable price range.

At farmer and government policy level, concern was expressed over the future of tobacco farming following an international trade policy agreement against burley tobacco, and recently experienced slumps in global tobacco prices. This concern was also reflected in the media as shown in the photographs shown in **Figure 6-7**.

Figure 6-7: Newspaper articles reporting concern about tobacco in Malawi

The World Health Organisation Framework Convention on Tobacco Control treaty of 2010 resolved to ban or restrict additives that make cigarettes appealing to first time users, a move seen as a 'constructive ban' on burley tobacco. Such a move was seen as having direct economic impact on Malawi which earns about 60% of its foreign currency earnings from tobacco. In FGDs, while respondents highlighted concern over the prices and future demand for their tobacco, the government sent mixed messages to farmers. On the one hand, farmers were encouraged to continue producing as normal since the ban would take some time to come into effect, and on the other, to diversity into new crops such as pigeon peas and various legumes. In an interview, Mautho Mvula reported that in as much as the extension

department was promoting diversification from tobacco given the market uncertainties, some farmers remained resistant to change.

> *"What we are telling farmers is, continue growing tobacco but also think about other crops because tobacco will not always give the best incomes. Some are listening, but I tell you tobacco is very strong here. If they stop growing tobacco what do they grow?"*
>
> Mautho Mvula, Key informant interview, Mzimba

Evidence from community interviews showed that the experience of food deficit as a result of market failure had stimulated adjustments within both the livelihood and food systems. In Mzimba, respondents recounted that in 2005 they faced one of the worst food crises mostly emanating from excessively high maize prices on the local market. The government of Malawi had exported maize to Zimbabwe on the advice that the following harvest would adequately replenish stocks to sufficiency levels. However, a drought was experienced and production fell below expectation. In addition, it emerged that the production of root crops had been over-estimated. As a result of these and other factors, maize market price was speculative and a deficit in the market was experienced. Tobacco farmers who predominantly depended on purchasing maize on the market were highly vulnerable and suffered as a consequence. Respondents interviewed argued that this experience demonstrated the fact that markets were incapable of delivering food security. Each household had to grow a significant part of its food to reduce exposure to market shocks.

6.3.2.2 Flexibility

In the face of dry spells and droughts, the study identified elements within the structuring of the market that had the potential for positively or negatively modifying the impact suffered so as to enable continued food accessibility. Various food and non-food items were being sold in smaller trader repackaged units to enable even poor households to afford, and for the trader, to increase volume of trade and maintain business viability. As shown in photographs in **Figure 6-8**, maize was sold on per kilogram basis compared to the normal bucket (20kg) or bag (50kg). Cooking oil was sold in units of as small as 100 millilitres, while sugar and soap were likewise repackaged into smaller and affordable units. With limited income following crop failure, more households could access such food and non-food items thus lessening the impacts of drought. However, other respondents argued that the smaller packaged units were more expensive in the long term than purchasing a larger unit.

> *"We pack according to our own measurements, there is no standard. Any changes are based on how we feel. The other reason is to let everyone taste oil or sugar whether he or she is privileged or underprivileged. To us, we maximise profits this way rather than by selling in original packaging".* Trader, Nyachilenda, Nsanje

Figure 6-8: (A) Repackaged cooking oil and sugar sold by a vendor in Nyachilenda in Nsanje (B) Maize and beans on a market in Mzimba (C) Maize trader in Nsanje selling by the cup or bag

There was demonstrable flexibility in the study area in as much as access to goods and services is concerned. Consumers could purchase food on credit, barter-trade often using small livestock and chicken, or bargain for a better cash price. Casual labour in agricultural or non-agricultural employment could be exchanged for cash or an equivalent in grain or non-food items such as soap. The labour for cash or grain exchange rate was reported as often falling as dry spells and droughts intensified implying more time investment in ganyu for the same amount of food or cash. In drought years this was seen as reducing chances of planting in the next season as affected households would concentrate on casual labour at the expense of land preparation in their own fields.

The food market in both study districts appeared to have minimal regulation in terms of health and food safety standards. No health inspectors were observed during the course of the field work. Individuals with food to sell do not require any special trading license, especially if the enterprise is on a small scale. This property of the market ensures a high level of food. In the case of deficits due to dry spells and droughts, food traders from

neighbouring districts would fill the gap. This was particularly the case in Nsanje. Maize traders interviewed in Nsanje reported that they had contacts within the district who gave them local intelligence on the maize supply situation and prices, enabling them to plan and supply the market when an economic gap emerged. Within Malawi, Nsanje has a strong identity as a drought, flood and food shortage prone area. According to local experts the Nsanje food market is well integrated with nearby districts and this helps maintain stable prices. On the contrary Mzimba, though generally more food secure than Nsanje, is less integrated with regional markets implying that deficits in food availability are quickly met by incoming trade stock thus increasing risk of a food price hike. In focus group discussions, respondents attributed the high food prices experienced in 2010 as a result of local farmers selling their maize to NGOs supporting earthquake victims in Karonga and creating a local deficit.

Informal seed exchange occurs within the villages studied, allowing farmers access to seed and, in some cases, preferred germplasm which is important for achieving crop diversity (hence food diversity) and acquisition of drought tolerant strains. Exchanged seeds are primarily legumes, including groundnut, bambara nut, and beans which are often less accessible on the formal markets. In communities studied there were no seed fairs identified. However, there were markets that move from one part of the ward to another on different days of the week. This rotation of the market day effectively reduced the distance to the market. During flood seasons some

bridges are impassable and roads not suited for vehicular mobility. This was reported as having the effect of cutting off communities from external food sources. Considering that places like Nsanje experience droughts and floods simultaneously, such a situation intensified the effect of droughts and reduced households' response capacity.

6.3.2.3 Transformability

Market infrastructure, with respect to access to appropriate seed and fertiliser for the different agro-climatic regions in Malawi, is very poorly developed. The central business district (Boma) is often a reliable source of goods, but it is usually located far from the villages it serves. Farm inputs are brought closer to the farmers by local traders who, inadvertently, have to factor the transport costs thereby raising the purchase prices. Farmers with low purchasing power often resort to use of retained seed to meet the season seed requirement.

Besides tobacco in Mzimba, respondents in both districts do not process most of their crop post-harvest. Drying is the common method used while most of the produce has to be sold as fast as possible before spoilage. As a consequence of hastened sale of crops, the prices that farmers receive are depressed. Low producer prices are compounded by the fact that the farmers have limited capacity to bargain with agro-marketers, as well as having low financial literacy. This often results in under-valuing the goods that they sell.

There are some historic and structural factors that have to some extent influenced the current diversity of cropping, the status of agricultural commodity marketing for smallholder farmers and the ease with which these systems can be transformed into profitable and efficient enterprises to support food and income stability. Among these is the model of agricultural development pursued initially by the Dr. Kamuzu Banda, Malawi's first president. According to interviews conducted in the study area, Banda's policies emphasised that smallholder communal farmers had to concentrate on feeding their families, and thus cultivate food crops, with commercial crops left for the estate farms. As one respondent noted:

> *"I could say that the government of Banda really taught people how to cultivate. The first thing he said was that he wanted people to have good food, good sleeping houses and clothing. In order for people to learn, he opened some farms and grew different crops like tobacco, maize and kept livestock. So, people could learn from him and spread the message through the villages. That's how he built those silos in Lilongwe".*
>
> Lirani Mumba, a former teacher in Vibangalala, Mzimba

While Banda's extension model may have worked to improve agricultural production expertise, a number of questions may be raised in terms of its actual effect on the transformability of the agricultural marketing structure in Malawi. The implication of such a model is that land for smallholder cultivation was locked in the demonstration fields, reducing production levels to consumption with minimal prospects for excess for the market. As smallholder farmers concentrated on non-commercial crops, the opportunity to develop appropriate market infrastructure were missed. In addition, as

evidenced during the course of the study, smallholder communal farmers generally lack financial numeracy skills owing to lack of skills development and low literacy levels, thus curtailing the profitability of their farm businesses.

Specialisation on a few crops may have, on one hand, influenced the low level of cropping diversity and concentration on maize, a crop with low drought resistance, while on the other hand, created national and farmer dependency on tobacco and sugar for income, crops that are very susceptible to global commodity price shifts. With minimal engagement in market-oriented production, farmers in the study area reported having to sell food crops to generate a cash income, despite knowing that their production was only sufficient for home consumption.

Another respondent argued that the agricultural policies pursued by Banda's successors equally did not favour well-structured food markets. Muluzi's market liberalisation policies created a culture of greed, while Bingu wa Mutarika's subsidy programme was very limited in scale and focused on maize (and tobacco) ignoring other crops.

> *"Banda taught people to farm. Muluzi taught people to steal; there were flea markets all over, people turned to food aid for survival. This one, Bingu, he is a bit better. He is trying to get people to farm again, but it's only maize, maize, maize!"*
>
> Victor Jere, Focus group discussion, Mzimba

6.3.2.4 Resistance

Elements of resistance within markets, and how such resistance contributed to better or constrained capacity of livelihood or food system response capacity in the face of drought, were identified. A number of derelict business units were identified in transect walks in both districts (**Figure 6-9**). Follow up interviews revealed that businesses that established in remote parts of the district had limited opportunity for long term viability due to constraints relating to access to products from the main urban markets. In addition, floods and poor transport networks had the effect of excluding these traders from participating in the wider market. This situation led to the exclusion of local communities from accessing various goods, including food, and services. In some cases, however, collapse of business was due to conflicts within families owning those businesses, poor financial management capacity and challenges with succession planning. **Figure 6-9** depicts some of the structures observed in Mzimba and Nsanje, respectively.

Figure 6-9: Disused trading stores in Vibangalala, Mzimba (A) and Nyachilenda, Nsanje (B)

The market in both study areas appeared to be buyer-driven; farmers had less control over prices and a weak position to negotiate prices.

> *"A trader can come to you and say, 'I want all those sweet potatoes and I will give you a thousand kwacha', what you can do? You just give him and take the money in case no one else comes to buy from you".*
>
> Respondent, Focus group discussion, Nsanje

During the harvest season commodity prices are very low, (e.g. maize may be priced at MWK18/kg compared to MWK65 later in the dry lean season) mainly as a result of high supply on the market driven by minimal capacity for postharvest processing and storage. With livestock, there is often limited purchasing power within communities and therefore the cash prices or rates of exchange for grain are also reported to be low. This inability of farmers to resist selling at low prices means that they generate very low incomes from engaging in agriculture to the extent that they do not often have sufficient reserves for ensuring adequate annual consumption. In the event of a drought, the capacity to respond is obviously compromised due to this lowness of income. Low producer prices also applied for tobacco, sugar, and cotton where buyers determined the grade and the price. Magnifying the effects of unfair terms of trade for cash crops were global market prices, especially for tobacco, which appeared to be increasingly unfavourable.

Despite the seasonal price cycles for food crops like maize and rice, (which effectively enabled external traders to bring in more food and effectively maintain prices lower), respondents indicated that within each season there was an informal market resistance in terms of producer prices. For example,

one observation made in Nsanje was that people were prepared walk a distance of up to 15 kilometres rather than pay MWK10 per kilogram more for their purchase. This market resistance while providing local consumers with some bargaining power was seen by small traders as viability of their business enterprises.

6.3.3 Policy

Policy is an integral component of institutions and markets, and also influences technology development, dissemination and use. This section focuses on policy as it relates to how organisations (a product of institutional processes) work, as well as how their actions in governing food and livelihood systems actually affect the capacity of these systems to respond to droughts.

6.3.3.1 Social learning capacity

In both study areas a combination of low staff retention and high circulation within the Ministry of Agriculture and Food Security was noted. On average extension officers interviewed have been resident in their respective duty stations for a period of two to three years. While recent staff recruitment may be accounting for this few years' residence, the same was noted for NGOs where new projects introduce new staff to beneficiary communities. At the end of such projects, some project staff may lose their employment and any institutional knowledge and memory may be lost from the local system as a result. In conducting fieldwork for this study, some of the staff within the

extension department showed limited awareness of the drought and flood history and patterns, local coping and adaptation history, and some of the local political issues within villages and chiefdoms.

Within NGOs implementing community development projects, including those related to disaster management and food security, baseline studies and end of project evaluations are standard practice. These reports provide a great opportunity for learning, with some reports made available having a section dedicated to "lessons learned". While it may be hoped that such lessons will shape future projects and enhance future capacity to deliver on livelihood and food security outcomes, the lessons reported are often technical in nature and refer to management practices relating to project cycle management. Issues relating to farmers' motivations, decision making processes, structures and constraints shaping actions and attitudes towards risk, among other issues, do not fall within the scope of evaluation studies as they appear "academic in nature". Academics were described as:

> "*Some of you*(researchers) *come into our communities, ask us questions and write down notes like you are doing, but they never tell us why they are writing, what they found out or what is going to happen to us following sharing this information*".
>
> Respondent in focus group discussion, Chibuli village, Nsanje

The lesson learning component of development projects is geared towards project management processes. Based on baseline or evaluation discussions, communities have come to accept that the purpose of being interviewed is to assess the amount of assistance the communities need. In some of the focus

group discussions conducted, it was obvious that within each village was at least a local expert in articulating the village's problems. The dominant messages so-articulated often included portrayal of need, as well as listing the various local needs and forms of assistance required. The influence of such individuals was that they could potentially distort what could be knowable about a situation, and the level of success of any social learning process.

Within various government departments, including in agriculture and meteorological services, a majority of staff members interviewed had not received any formal training on issues relating to climate change and climate change adaptation. The concept of climate change adaptation appeared confusing to some respondents, especially with regards to how it related to disaster management, a more commonly applied concept. Notwithstanding, extension officers showed awareness of some of the weather changes in the local area and were able to provide recommendations to farmers, albeit with reservation given the high degree of uncertainty.

Lack of training on the part of the extension services staff, including receipt of knowledge updates based on new innovations from agricultural research, meant that the organisational capacity to promote effective drought response capacity was compromised to some extent. Limited funding opportunities for in house training within government departments thus created a situation where staff in NGOs had an upper hand in terms of community climate change adaptation or disaster management capacity building. The

challenge with such an arrangement appears to be the sustainability of benefits of training and knowledge generated. Where external partners provide such services to communities, the likelihood of continuation beyond the project life was often perceived as unlikely unless localpartners were involved in a strategic fashion.

Of the two sampled districts, Nsanje was the one with local level disaster management committees. Subsequent interviews with members of disaster management committees in Nsanje revealed that this institution had emerged following the experience of extreme climatic conditions, including drought and floods. An interview with a district council in Nsanje indicated that presence of organisational structures at the grassroots enhances the capacity to respond to disasters. With capacity building, this respondent argued that communities could be empowered to innovate and be more responsive to disasters.

> Author: *"What has been the effect of the decentralisation policy on effectiveness of disaster management at the local level?"*
>
> Thomas Bizeki: *"Now we have structures put in place. We have village civil protection committees, area civil protection committees and the district civil protection committees. In the villages people are empowered and oriented in terms of early warning signs and how to respond to a disaster, identify affected families and communicate even before the department of disasters can get there. So there is that empowerment of people to be more responsive so they can think of mitigation measures in terms of droughts and floods".*
>
> Thomas Bizeki*, district council official in Nsanje Boma

In the quote above, Thomas Bizeki provides an example of building self-sufficiency within communities in terms of disaster risk management.

Empowerment is seen here as letting communities deal with disasters on their own, in other words, raising their agency to deal with their own circumstances. From Thomas Bizeki's statement, it may be seen that 'empowerment' in fact means reducing the power of the district council and other actors, to allow the community to exercise its agency and respond to stresses. To evaluate if the 'empowerment' has been effective would require examining the extent to which communities have the skills and resources to respond on their own when faced with disasters.

6.3.3.2 Flexibility

The government of Malawi's policy on decentralisation was perceived by district planning officials as promoting the articulation and focus on locally relevant issues and directing resources towards locally agreed priority areas. Development partners seeking to work in specific districts are expected to consult with the district assembly and be provided with both the thematic areas and target locations. However, while decentralisation offers more flexibility in terms of resource use, interviews with staff in district administrations reflected that the districts had very low revenue generation capacity given low industrial activity in these rural districts. Due to limited financial capacity it was argued that in most cases droughts and floods required action from the national government. At a local level those stakeholders with financial power had the capacity to influence what could be done, despite the existence of an institution for managing this process.

Donors and NGOs have funding priorities for specific time periods and these priorities supersede the local government plans to such an extent that local partners have to tailor-make project proposals in such a manner that the locally relevant issues may fit in. For example, disaster risk reduction is a priority area for funding in Nsanje, and the focus area is flood risk management and response. Drought, soil fertility management, and seed systems are key areas limiting farmer productivity but may not fit into some of the available funding budgets.

> *"As a district council we have our own priorities, issues that affect our people here in Nsanje. But the council has no financial muscle to determine what gets done".*
>
> Eric Kanjana*, district council official, Nsanje Boma

One staff member in a local NGO in Nsanje reported having to submit a proposal for "flood resistant crops" as the only option to get funding that could also have the effect of enhancing capacity to respond to drought and dry spells.

6.3.3.3 Transformability

The range of challenges experienced in Mzimba and Nsanje provides opportunities for employment within these districts. Interviews with staff working for international and local NGOs indicated a sense of job security within the sector on the basis that "poverty is here to stay". One respondent working in an NGO in Nsanje commented as follows:

> *"People working in emergencies will always exaggerate the situation to maintain their jobs, if there is no emergency they have no jobs".*
>
> Margaret Chilembwe*, NGO staff, Nsanje

Within beneficiary communities, presenting a vulnerable face ensured access to free food and agricultural inputs like seed and fertilizer. Thus as long as communities appeared to be in need, then the status quo was maintained and system transformation to enable an internally driven response capacity was curtailed. For example, where advocating for improved irrigation access was the most cost effective approach, if it meant that other projects were not considered for funding, thus compromising employment security, then it was not pushed for. Such a scenario may be seen as potentially impeding transformability of a livelihood and food system.

Rights-based approaches to delivery of disaster management and food security programmes were perceived by some community members, particularly in non- targeted areas, as giving too much power to communities to demand assistance rather than identify options to innovate to survive the climatic and other hazards they were exposed to. By focusing on vulnerability and not resilience, well intended interventions may fail to create the space for livelihood transformation that recognises the changing environment in which livelihood and food systems function. Moreover, the protection of livelihood assets, while ensuring that households were able to retain or recover lost assets following a drought or flood, had the danger of maintaining livelihoods at a false "stable state" which may not have been

tenable given other changes taking place. Eventually this limits the transformation of livelihoods.

In Mzimba one international development NGO is using "change agents" selected from within villages as agents of change in those villages. Change agents have a role in promoting new products, including technology use, and influencing attitudinal changes. In Nsanje, change agents were being used to promote use of mosquito nets and to change the attitude that mosquito nets were meant for birth control through restricting sexual activity; in Mzimba change agents had a role in promoting appropriate techniques for fertiliser application. Some staff in NGOs, however, questioned the value of these change agents in transforming local community actions or ways of thinking, arguing that these agents were selected from the communities themselves and therefore "they think like village people", a phrase that implied that the community change agents were equally backward in developmental terms.

6.3.3.4 Resistance

Communities living in zones at high risk of hazards such as the marshes of Nyachikadzi in Nyachilenda EPA in Nsanje have been resisting government efforts to relocate from the flood-exposed marshes in the Lower Shire. Respondents from Nyachikadzi village argued that while the floods occasionally lead to loss of life, livelihoods and livestock, their livelihoods are based on the flood plain which supports flood recession irrigation of

sweet potatoes and other food crops, from which cash income and food could be derived. Permanent relocation to the uplands was associated with loss of land and the additional burden of renting land in the upland. Key informants interviewed in Nsanje counter argued that claims of not wanting to leave their forefathers' graves in the marshes were excuses to remain in a vulnerable place and therefore deserving disaster relief in the event of flooding. Politically, however, a move into another chieftaincy meant that a village, or groups of villages, would cede their traditional leader's power to the resident chief and in the process relinquish their identity.

6.3.4 Technology

This section on technology encompasses the various practices, processes and tools that, when introduced into a system, are likely to improve overall performance of that system. The ability of technology to contribute to resilience was tested by analysing social learning capacity, flexibility within the system and resistances which critically shaped the value of the technology and its impact on ability to cope.

6.3.4.1 Social learning

Droughts and severe dry spells were identified as conducive for stimulating learning among farmers, particularly in cases where certain technologies had been rejected. Extension officers interviewed argued that in a drought year farmers often lost their seed resources and were willing to experiment with

any seed, including hybrid seeds and new crops, that they had previously not used.

> *"It appears that when they have a bad year, the farmers are more responsive to agricultural advice".*
>
> Patricia Lungu, Key informant interview, Nsanje

> *"Yeah I can say there are changes but not much. Only a few farmers are changing. I am saying this because in the past, before I came here, there were people from Mozambique during that war, you know, and most people were staying here. So there was nowhere to cultivate. And the government started distributing food for all, those who were coming from Mozambique and even those who were from here, because the land owners here had nowhere to cultivate. As a result these people got used to receiving, they are always saying 'give us, give us'. So whenever we are trying to go there with technical advice, instead the farmers were not participating because they are used to receiving free issues. So, little by little they are changing and now the government stopped giving free issues and now they are more willing to learn and some people are now participating. That mind of free issues is still in their minds".*
>
> Edward Gonani, Key informant interview, Nsanje

The quote from the interview with Patricia Lungu reflects that the trauma caused by the drought appeared to have a positive effect on willingness to learn from extension officers, with the hope of averting similar margins of loss in the future. It was reported that after a drought, farmers are often willing to plant any seeds they can lay their hands on. This may be an opportune chance to break any resistance or habits in the system and transform them through improved farming technologies. However, it remains questionable whether these new techniques introduced in this way actually increase the level of resilience. According to Edward Gonani, the generally low rate of participation in agricultural training programmes run by the agricultural extension officers was due to a culture of dependency on relief aid. As a consequence, locals in Nsanje appeared to participate more

actively in capacity building projects run by NGOs, some of them with limited local experience, rather than in those run by local extension staff who were highly unlikely to offer them "anything more beyond the training". Thus while agricultural extension officers trained farmers on farming practices, NGOs trained and provided seed, fertiliser and in most cases food assistance thus increasing the likelihood of technology uptake.

With such technologies as conservation agriculture being promoted for reducing exposure to drought, there is evidence that lessons learned by partners may not be appropriate relative to local farmers' learning and experiences. The promotion of conservation farming in Malawi is based on evidence of higher yields attained under the practice in such countries as Zambia, South Africa and Zimbabwe. Interviews with extension officers and farmers practising the technology in both districts emphasised the fertiliser placement technique and seed availability as the main contributors to higher yield, while the promoters of the technology perceive it as a soil moisture (drought management) practice given current climate variability.

Farmers were also learning directly from other farmers across the border. For example, a fertiliser application system used in Zambia where maize yields are very high was adopted by some farmers in Mzimba with no modification. The following quotes exemplify this:

> *"The unfortunate part with the inorganic fertiliser, which you have also noticed, is that they just apply it on the surface and do not bother to cover. The benefit which come from the use of inorganic fertiliser is reduced, maybe they get a third of the benefit. So it's wastage. I understand they got this practice from Zambia, that's where they copied it from"*.Mautho Mvula*, Key informant interview, Mzimba

> *"The timing is also wrong because we advocate that they apply the fertiliser at planting and then twenty one days after planting. So, (*instead of what we advise*) they wait until the maize gets to about knee height and then apply both fertilisers at once"*. Esikomu Nyirenda*, Key informant interview, Mzimba

The transcripts above suggest that farmers appear to trust other farmers, especially where yields are higher, for advice. This advice appears to conflict with the agricultural extension officer messages and the failure by farmers to adjust the practice to local circumstances may undermine the contribution of the techniques to crop yields. The issue of adequacy of labour to cover the fertiliser was not discussed, but could be central here in explaining the Zambian context, where ganyu was provided.

The social learning process, in as much as this technology is concerned, could be critiqued at various levels. While specific measures were not taken in the fields surveyed, extension officers agreed that in most cases the farmers targeted tended to put more attention (e.g. weeding frequency) on the demonstration plot compared to the conventional practice. The reason for such a typical Hawthorn effect (Adair, 1984), whereby behaviour of individuals is altered by the fact that they are cautious that they are under experimentation, was cited as follows:

> *"Farmers here are very clever, they know this is an experiment and they know you are trying to prove that your technology works better than theirs. They will give you just that. If your technology works, for them it means continued supply of seed and fertiliser, which is probably all that they are concerned about".*
>
> Mulimbe Bemba, Key informant interview, Nsanje

This example suggests a risk that some of the technologies promoted could be based on compromised learning processes. The danger in this case is that the benefits of such technologies may be maintained as long as the inputs are supplied, but the main weakness is the missed opportunity for building more sustainable solutions. Higher food productivity may not be sustainable without seed and fertiliser supply, as they may be more limiting than technology use.

6.3.4.2 Flexibility

There is no strict enforcement of seed laws and breeder's patents in the study areas resulting in farmers having the opportunity to save seed, exchange or sell seed within the community without any fear of prosecution. These flexible seed laws promote local level access to planting resources thus increasing diversity of crops, including those crops offering good resistance to drought.

Several agricultural technologies ranging from seed type to soil and moisture conservation were observed in the two study areas. Specific attention was focused on two: conservation agriculture practiced for managing soil fertility and moisture, and the use of hybrid seed of shorter season length for

improving crop performance in a shorter cropping season regime. The following observations were made:

The promotion of conservation farming is based on best practice guides and often implemented as outlined in the handbook by extension officers and staff in NGOs. While the technology may have worked well in Zambia, local implementation seems to ignore local realities like the flat terrain in Nsanje (which leads to severe water logging on conservation farming plots), soil type (planting stations on sandy soils are easily destroyed by wind action or animal movement) and land area (where farmers have very small plots the demonstration plot may take away a significant portion of their land and limit cropping diversity). This lack of flexibility in the implementation of the technology appears to restrict normal farming practice like inclusion of legumes as an intercrop. Of the fields visited by the author, there was no clear difference in the farming practice from one farmer to the next, indicating that the strict practice guide was stifling farmer innovation.

Use of hybrid seed, on the contrary, reduced the flexibility with which farmers could re-establish their crop following a mid-season dry spell experienced in the 2009-2010 farming season. This was particularly true for Nsanje where a majority of farmers depended on hybrid seed sourced from the market, compared to retained seed used predominantly in Mzimba. For hybrid seed users, replanting after the dry spell required additional purchasing of seed from the market, and in some cases that placed a demand for additional involvement in casual labour provisioning. Farmers using

"low technology" retained seed had often kept some reserve seed for gap filling and were able to replant and take advantage of slight improvements in rainfall activity and harvest some crop.

6.3.4.3 Transformability

Transformation based on new technology uptake was seen as more feasible following a catastrophic event such as drought or floods which often led to total wipe out of seed stocks. In the absence of their usual seed, farmers were more likely to take up whatever was available as planting material in the following season. For extension officers, this phase was seen as critical for transformation of farming systems especially with regards to promoting use of varieties seen experimentally as most suited for local environments. There were a number of challenges faced by both extension officers and farmers in this transition. There was no guarantee that the promoted variety would work any better than what farmers had been using, especially if the following season faced similar or worse drought conditions. Secondly, even if the new variety performed well, and was taken up by farmers, the seed supply system was often too weak to ensure longer term technology utilisation, thus forcing farmers to revert to the usual practice. In Nsanje, seed programmes had only concentrated on assisting farmers with maize seed and therefore not promoting transition towards sorghum, a crop perceived as more climatically suited.

In Mzimba there was an interesting difference in maize preference under drought conditions at household and community levels. At household level,

preference for maize was inclined towards hybrid varieties while in community level discussions preference was for local seed. This difference may be explained by different values attached to a technology by different social actors, e.g. farmers, ADOs and NGOs. In this case, hybrid maize was preferred at household level reflecting perception of drought risk and food security at that level. At the community level, higher order values like identity may be more of greater interest. On this basis, it appeared that introducing a new crop technology would not impact on technology uptake per se, as individuals would take up a variety if other conditions allow (e.g. cost implications, labour availability, accessibility) thus allowing transformation in seed and farming systems. There is, however, no evidence to suggest that the new system would deliver on food security goals more effectively than the initial system.

Some households were seen as more likely to learn and transform than others. Education was not rated as an important factor, although younger farmers were in general seen to be more open to new ideas. Households in the middle class were seen as more innovative and more likely to take up new farming methods, including those related to drought risk management, compared to those in the lower socioeconomic bracket. These households in the middle were perceived as highly motivated to achieve more, to progress to the next level and more better resourced to take up these new techniques. This is reflected in the following quote from a focus group in Nsanje.

Author: *"What are the characteristics of local innovators, or households that are early adopters?*

Cecilia Kawinga: *"Well, we can characterise them as middle class because they have enough to feed their families and have surplus to sell. So those are the people who see the benefit of having more, so that they have more surpluses to sell. But the subsistence farmers that's where we are having a problem, they get two bags of fertiliser, just apply and they are only concerned with having enough to eat themselves. They are not concerned with excess, although they are forced to sell that small amount of maize because it is the only commodity they are able to sell to anybody at any one time to buy salt, sugar and all these basic requirements".*

Cecilia Kawinga, Focus group discussion, Nsanje

6.3.4.4 Resistance

The dominant view among extension officers interviewed in the study areas is that farmers that resist new technology perform poorly and that resistance to new agricultural technology is an important cause of poor agricultural performance. In Mzimba, maize farmers using local maize varieties identified quality traits such as taste and consistency of meal from local maize as superior to the hybrid maize. In addition, they argued that the requirement for fertiliser and post-harvest chemical sprays with hybrid maize, compared to manure and ash for fertiliser and post-harvest treatment with local maize, made the local maize more suitable within their production systems. Seed for local maize could be saved or sourced locally at a relatively lower cost than hybrid seed, and therefore local seed based seed systems offered a higher sense of stability than market dependent hybrid seed systems. It emerged through these discussions that what farmers considered as important traits were different from the extension officers' views, and by

not subscribing to the extension officer view, farmers were seen as deviant and resistant.

There are some farming practices that are seen as resistant to new technology by extension officers. They including storage of maize while on the cob and with the cob leaves, and applying ash for protection against pests.

> *"In some cases farmers may not want to use storage chemicals in nkhokwes because of the traditional means of storing the crop, they just harvest it without shelling and then put it in the granaries. So we are saying they should use modern granaries, shell the maize, apply the chemical and keep in closed well roofed granaries. For the locals, they use bamboo and put their grain, that's why they have so much loss. So sometimes it's just that they do not want to have all that trouble of harvesting and shelling and putting in the modern granary. They will take that as additional work. In that regard we are saying, 'no!' because LGB will even destroy the local granaries. The LGB was initially a pest for trees and now that it has come, it wants something that is woody. It will start with eating the cob, grain and then go for the granary. So sometimes you just see the granary collapse".*
>
> Edward Gonani, Key informant interview, Mzimba

"The main problem is the attitude of the farmers; they are too used to local varieties. They were thinking that maybe their varieties would withstand the pressures of the larger grain borer but they have been proved wrong. They are realising that the larger grain borer will take anything. Now they are saying, we should try and produce more so that if the LGB comes, we are left with something...but it's sweeping everything, almost. So farmers are switching by and by to the open pollinated varieties. Those middle income earners I spoke about, they are going for hybrids".

Patricia Lungu, Key informant interview, Nsanje

> *"It's not really resistance; it's a culture so they do not see anything wrong with their methods. We demonstrate the yield differentials with covering* (fertiliser with soil after application). *They see it, but they say their method is faster, so they do not change. But I hope they are going to change, because even the planting of one-one* (One plant per station compared to two in conventional practice), *it took a while to change but it caught up. Or switching from local to hybrid, it's also coming up. So change is a process, it takes time. We are having more and more farmers following what we are saying, and we have others following other farmers who have taken up, the local innovators".*
>
> Esikomu Nyirenda, Key informant interview, Mzimba

The responses by the three agricultural extension officers offer a number of perspectives on the subject of resistance to technology. In both cases, refusal to take up technology was seen as rooted in cultural or traditional values, when in fact farmers were not taking up new techniques simply on the basis of economics - inadequate labour for the additional work that came with the new technology. At the same time, it was clear that some of the promoted technologies did not always present an immediate benefit to the farmer, and in some cases could be seen as reducing yield potential, e.g. one plant per station has half the maize population in an acre of land. Part of the problem with technology, as cited by extension officers and farmers, was the extension officers were bringing too many messages and therefore confusing farmers. Different actors, including extension officers and NGO staff, were providing capacity building in agriculture and in some cases 'preached different gospels', as one farmer in Nsanje put it. ADO staff appeared to lack the power and monopoly in farmer capacity building. In fact, they were open to all new ideas and ready to get training and broadcast new messages. Part of the reason for the limited ADO training capacity was the lack of sufficient government-owned agricultural research feeding into extension work.

6.4 Summary and Conclusions

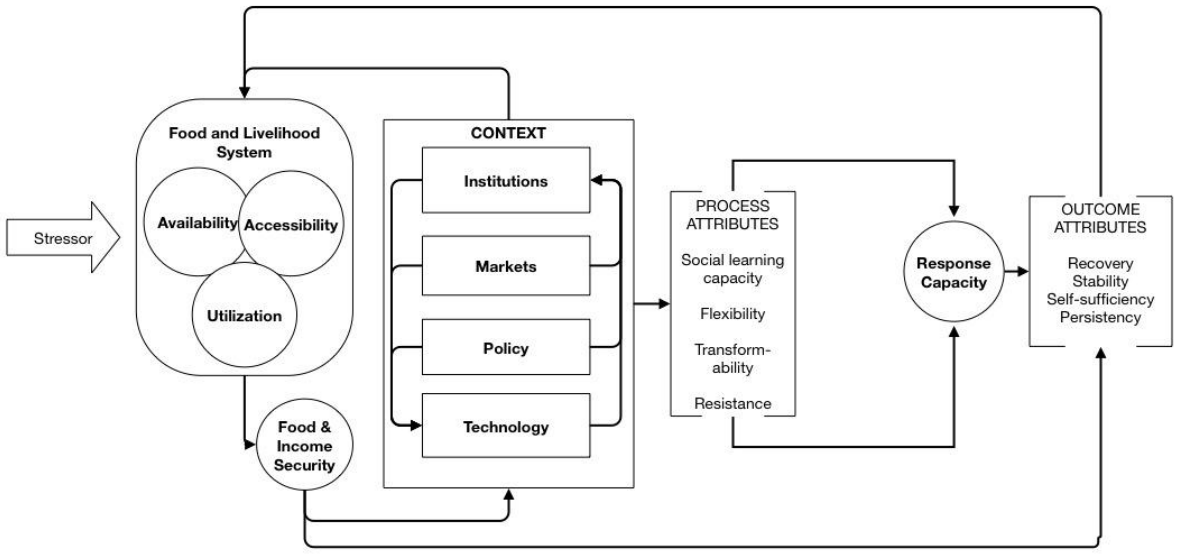
This chapter aimed at evaluating the extent to which the context within which livelihoods and food systems are located, influence the resilience

outcomes as indicated by the ability to maintain response capacity. The schematic model adopted in this analysis identified institutions, markets, policy and technology as key parameters that define the context. For each one of these four parameters, the attributes of resilience identified in Chapter Two were applied to examine how outcomes consistent with resilience were promoted or diminished in the study areas.

Evidence presented in this chapter showed that all the attributes of resilient systems were represented to different degrees in the study areas. This suggests that resilience is an internal property of livelihood and food systems. It varies in relation to a set of enabling and limiting factors. Livelihood assets like access to finance and land, for example, were found to enhance capacity to implement lessons learned in coping and adapting to droughts and other stresses. In the schematic model, of the eight attributes of resilient systems, the analysis presented in this chapter shows that attributes like social learning capacity, flexibility, resistance and transformability are key process attributes. They determine the level of resilience, while attributes classified as secondary, including recovery capacity, persistence, self-sufficiency and stability were outcome-based attributes which demonstrated resilience after a system had been exposed to stress. In other terms, the outcome attributes are post-hazard indicators while the processes ones are pre-exposure indicators. However, the relationship between these two sets of attributes could be more fluid depending on the perspective taken by the system manager, e.g. preparedness planning versus post-disaster

management. This finding is very important as several scholars on resilience choose only one or two of these attributes in assessing resilience and therefore run the danger of over-or under-estimating capabilities of coping with adversity.

A revised schematic model for assessing context was produced through reviewing the initial model against the evidence from the analysis of field data. It was shown that the system should be more clearly represented and the interactions within the context parameters and between the food system, context and resilience attributes could be represented more dynamically. The model in **Figure 6-10** summarises a revised model for examining the effect of context on food system resilience.



Source: Author, 2012

Figure 6-10: Revised schematic model for assessing the influence of the context on resilience in food systems

The conclusions of this chapter indicate that despite common association of resilience with material values, such as livelihood assets, the context matters

substantially to the system's resilience. Context dictates how assets are used to generate response capacity. Additionally, response capacity is a product of relations of power between social actors, their values, worldviews, and priorities. The differences between conditions, including material asset command and access, prevailing at the household level mean that in the face of stress, the capacity to respond will vary and because the needs are different, no 'one size-fits all' approach can work to effectively promote desirable resilience. By analysing the context in the study area and considering the differences in material or livelihood asset access and ownership across the study population, this chapter concludes that, on the basis that resilience attributes were displayed across socioeconomic groups, resilience must be extant in all socioeconomic groups. However, the meaning of resilience will vary from one socio-economic group to another. On this basis, resilience should be approached differently depending on the context. The determinants and factors that maintain resilience, or its surrogate response capacity, will likewise vary. **Figure 6-11** attempts to show this association.

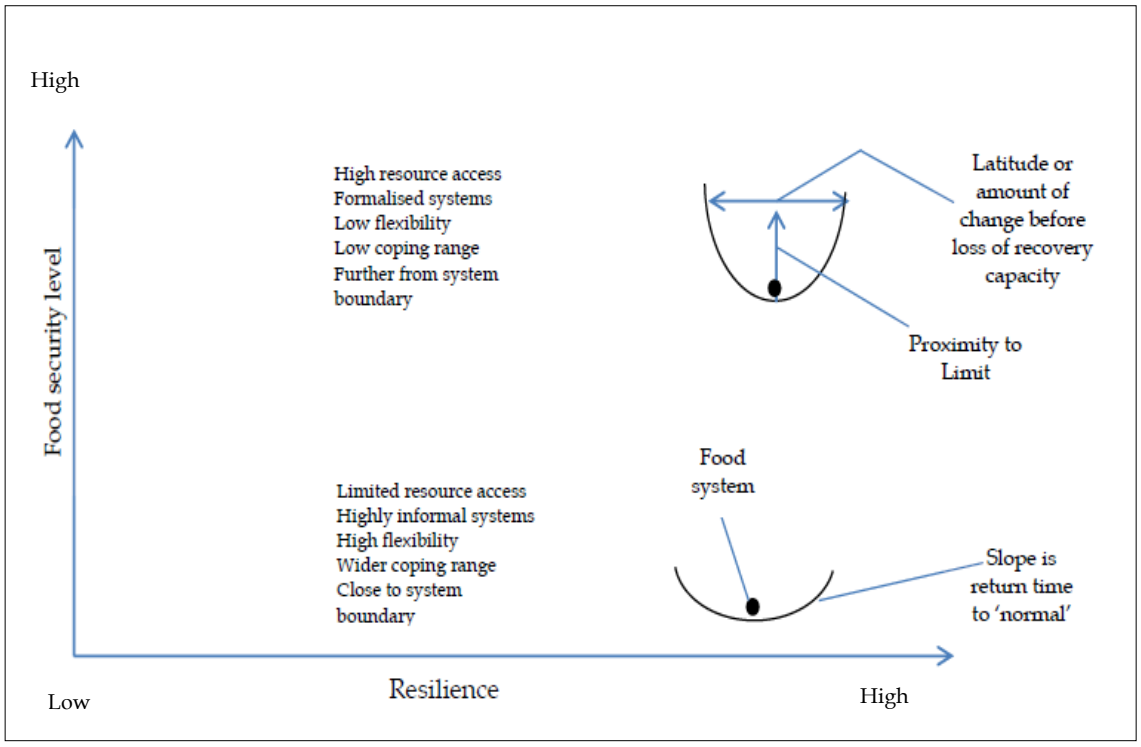


Figure 6-11: Food security outcomes at high resilience level

Source: Author, 2012

Figure 6-11 assumes a single stable state and shows two scenarios. In the top scenario, the system is highly resilient as a result of high resource availability, successful specialisation in a few livelihood activities (e.g. tobacco farming) and a low flexibility in the rules governing the system (e.g. mandatory instalments for credit). The threshold of the system and its latitude are relatively higher than in the system represented by the basin at the bottom of the chart.

The wider basin shown at the bottom of **Figure 6-11** also has high levels of resilience but offers only low level outputs from the system. In this case, food security at household level is low but the household has capability of effectively responding to stresses at that low level. The slope of the basin is

flatter meaning that return time to stable equilibria is lower. This is consistent with the results in Chapter Four and Five which showed that poor households do not have much to lose in drought or floods due to low resource access. In the top basin, households in the middle and upper socioeconomic classes reported taking decades to recover fully from some of the worst droughts suffered. Informality and flexibility of rules associated with low socioeconomic groups promote their resilience to stresses. Thus, while the moderately well-off socio-economic groups and the rich see resilience as recovery of lost assets and growth, over the long term through learning and transformation, the poor perceived resilience as the capacity to survive. While this capacity may be associated with assets, non-material factors including attitude, faith and habits were also found to be very important.

In revisiting the literature on resilience theory, a number of conclusions were drawn in this chapter. Pickett et al. (2004) define resilience as flexibility over the long term. The results presented in this chapter showed that informal and flexible systems promoted resilience in some contexts through widening the coping range. However, some of such measures taken in response under such informal and flexible contexts were of value only in the short term.

The presence of social protective factors, including presence of faith based and social networks are reported as enabling resilience to stresses (Kaplan et al., 1996; Cutter et al., 2008). Consistent with the findings by Bunce et al. (2011) and Adger et al. (2011) which argue that some well-intended policy

and programmatic actions may have negative consequences for resilience, the results presented in this chapter showed that while government and NGO support may be supportive(thereby reducing the level of damage suffered), if ineffectually designed may lead to dependency. It was found that dependency on relief aid may lead to lost opportunities for learning, hindered innovation and blocked transformation of livelihoods and food systems. This chapter also showed that while development projects and policies had the danger of weakening agency of social actors, transferring power to communities with limited capacity of making certain decisions or with constrained resources to implement the decisions made, was tantamount to non-empowerment at all.

Capacity of learning and use of memory in anticipating future situations are associated with resilience (Klein et al., 2003; Folke, 2006). Garmezy (1994) defines resilience as long term cumulated skills, abilities and knowledge. The results showed that there are power issues that influence how available knowledge, skills and abilities are used. Importantly, it was shown that experience of stress is an important factor in creating opportunities for learning and system transformation. Social protection measures, as discussed above, may block or facilitate transformation. However, transformation of livelihoods without dealing with the underlying constraints means that the 'new system' may fail to be persistent in the long term. While the period following loss was identified as a point where transformations are most likely to take place, the process of transformation was also found to be the

point of highest vulnerability to harm as institutional memory of dealing with certain challenges could be absent.

Chapter Seven

Discussion and Conclusion

7.1 Introduction

This thesis analysed food security in two rural districts in Malawi to investigate the processes through which vulnerability to climate change in human populations was produced (relating to Objective 1, Chapter 1), and further explored the factors that enabled or diminished household level coping and adaptation capacity in the face of drought and other stressors (Objective 2). In the light of this analysis, the thesis evaluated the applicability of resilience theory (Objective 3) for both enhancing understanding and managing food systems faced with environmental and social change uncertainty. The empirical chapters (Chapters 4, 5 and 6) have so far provided evidence related to the first three objectives and have not yet explored adequately the inter-relations between resilience, vulnerability and adaptive capacity (Objective 4). It is thus to this more complex and more abstract objective that we now turn.

A schematic model for understanding the anatomy of resilience was developed in Chapter Two (**Figure 2-6**) based on the key theoretical ideas and questions emerging from the review of literature. This schematic model described the vulnerability context in terms of the social, economic, demographic, political, historical and environmental dimensions, and

hypothesized that livelihood assets and institutions were important in shaping both the vulnerability context and the response and adaptive capacity in the face of stressors. Through modification of the Sustainable Livelihood Framework (SLF) to include a substantial and yet often under-theorised aspect of human response capacity, the culture factor, the schematic model analysed the influence of livelihood assets, structures and processes on coping and adaptive capacity as a basis for understanding the determinants of resilience. The context within which households responded to drought was assessed from the institutional, policy, markets and technology perspectives and compared against a set of attributes of resilient systems identified in the literature review (**Figure 2-1**). The following sections discuss the findings of this thesis in the light of the broader literature on resilience and draws up some conclusions based on the study areas in rural Malawi.

7.2 Vulnerability and resilience are related but not opposites

This thesis evaluated the extent to which the concept of resilience was applicable in both the analysis and management of food systems in the context of increased drought risks due to climate change. Outputs from this evaluation were expected to inform the development of a conceptual model for resilience which would form a basis for policy making.

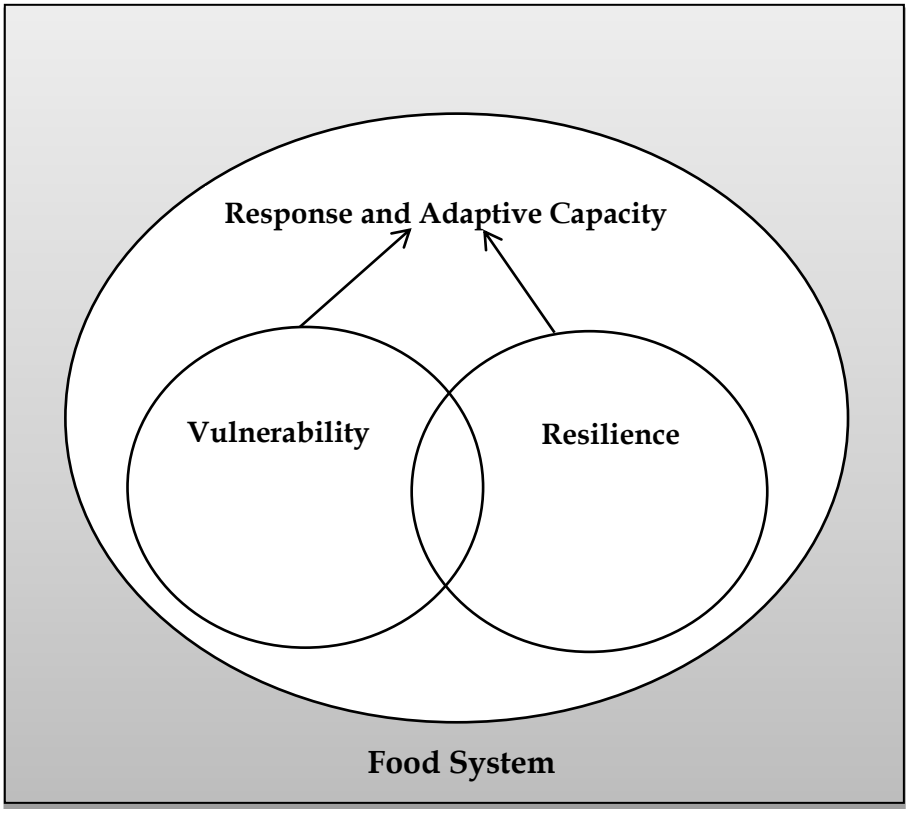
The literature review (Chapter Two) highlighted some of the complexities associated with the adoption of the resilience perspective by arguing that

some policies and programmes designed to address vulnerability had inadvertently undermined long term resilience. The failure to promote resilience in addressing vulnerability was seen as resulting from absence of an appropriate framework for linking these two concepts (Bunce et al., 2010; Adger et al., 2011; Burton and van Aalst, 2004). As one of its objectives, this thesis sought to use evidence from both the literature and the field study to interrogate further the relationship between vulnerability and resilience in order to develop a framework within which resilience and vulnerability could be simultaneously addressed in food and agricultural policy.

On the basis of evidence drawn from the case studies analysed, this thesis concurred with the observations made by Bunce et al. (2010) and Adger et al. (2011) that some of the measures for addressing vulnerability had in fact undermined resilience to future stressors. In Mzimba, buying relief maize from local farmers to raise their incomes led to a local food price crisis that severely undermined food accessibility for poor households (Ch. 4, § 4.31). In Nsanje, protracted food aid created dependency and weakened motivation and capability for producing own food (Ch. 4, § 4. 4. 1.1; Ch. 6, § 6.3.1.1(2)) and public works programmes in the two districts had increased income earning opportunities while distorting the local norms with respect to sharing of farm labour (Ch. 5, § 5.6.1.3).

With regards to the relationship between vulnerability and resilience, and in contrast to the view by scholars such as Twigg (2007:6) and Folke (2006:262) who see the concepts of vulnerability and resilience as being opposites, (i.e.

increase in resilience means a reduction in vulnerability), this thesis used examples that demonstrated that the two concepts are closely linked but not opposites since they measure different things on parallel scales. Vulnerability is concerned with susceptibility to injury while resilience denotes the capacity of a system to absorb shocks and avoid crossing a threshold into an alternate irreversible state (Resilience Alliance, 2007). These two concepts, while perhaps too close for comfort to allow for a maturation of either with respect to the other were, however, linked through their effect in shaping the general response and adaptive capacity. This relationship is illustrated in **Figure 7-1**.



Source: Author, 2011

Figure 7-1: The relationship between vulnerability, resilience and adaptive capacity

Figure 7-1 suggests that there is an interception between vulnerability and resilience. To appreciate the vulnerability of a food system, one should take into account the resilient elements or processes within that system that render it vulnerable in the first place, or sustain vulnerability for the long term. If resilience is understood as the capacity to absorb stresses and continue to develop, then the vulnerability component in resilience could be understood in terms of systems attaining a state of resilience to such an extent that they become too rigid, and therefore are more prone to collapse (i.e. rendered vulnerable). Both concepts (vulnerability and resilience) ultimately shape the range of options available for coping and adaptation.

The results presented in this thesis (Ch. 4, § 4.3) supports the perspective that multiple stressors operating across temporal and spatial scales were responsible for driving vulnerability in food systems, as suggested by Ericksen (2008) and O'Brien et al. (2004) among others. Given the wide range of stressors identified by this study, the evidence suggests that building resilience should not be based on stress-specificity, but rather focusing on general resilience could add more value to response capacity. In the study areas covered by this study, respondents who failed to mitigate against floods or, at least take advantage of flood recession to irrigate, had the least resources for coping with droughts and other stressors and were most likely to face food insecurity (Ch. 5). Resilience to drought without resilience to floods implied that failure to effectively cope with floods led to loss of resources, including knowledge, that were vital for coping with droughts. As

a consequence, impact of drought on food security would be expected to be higher than in a scenario where general resilience had been the approach.

While acknowledging that the interaction of slow (long term) and fast moving (proximate) factors was critical in shaping sensitivity to drought-induced food insecurity, the results presented suggest that the context, as defined by household specific circumstances, within which these variables interact was even more important than the mere experience of stress. It was shown, for example, that the experience of floods produced different food security outcomes depending on household access to land in the flood plains and availability of manual labour. The results in Chapter Four also showed that the ability of a household to respond to a dry spell or drought depended not only on how well it had responded in the past, but rather on the sufficiency of resources that were left over from the last drought, attitude and indeed experience. Thus assets available today may not effectively predict long term resilience, especially where several other factors made predictions about the future inaccurate.

According to Watts and Bohle (1993), vulnerability is influenced by environmental and social forces. While the results presented in Chapter Four support this view, the overall analysis of food system vulnerability in this thesis suggests that the global environmental change school, as shown in various GECAFS publications, including Ericksen (2008) seemingly places more emphasis on the drivers and feedbacks that produce vulnerability than developing an understanding of the factors that sustain vulnerability and

why these are persistent. Ericksen (2008) and GECAFS (2005), for example, perceive food security as an outcome of food systems which are influenced by social and environmental drivers and feedbacks but appear to accord less attention to the root causes of vulnerability. In addition, the DFID (1999) sustainable livelihoods framework, which is widely applied in development programming in developing countries, does not explicitly address the issues of underlying causes of vulnerability, but rather indicates that the vulnerability context should be understood in terms of shocks to the livelihood system, seasonality, trends and changes occurring over time. However, it was demonstrated in Chapter Four that the drivers of vulnerability in fact worked only to expose the symptoms of vulnerability but did not essentially sustain the state of vulnerability. Factors such as poverty, ignorance, social injustice, institutional failure and dependency were identified as key factors that were sustaining vulnerability in the study areas (Ch. 5 § 5.24; 5.41 and Ch. 6 § 6.3.1.1). These factors were seen as reinforcing the various vicious cycles which were trapping people in conditions that hindered capacity to respond to droughts and other stresses. Ganyu, for example, led to delayed planting which was reported to reduce attainment of yield potential and also undermined household labour availability which reduced the capacity to take up farming technologies, including those that had the potential for contributing towards long term resilience to droughts and other stressors (Ch. 4 §4.33; 4.4.3.2).

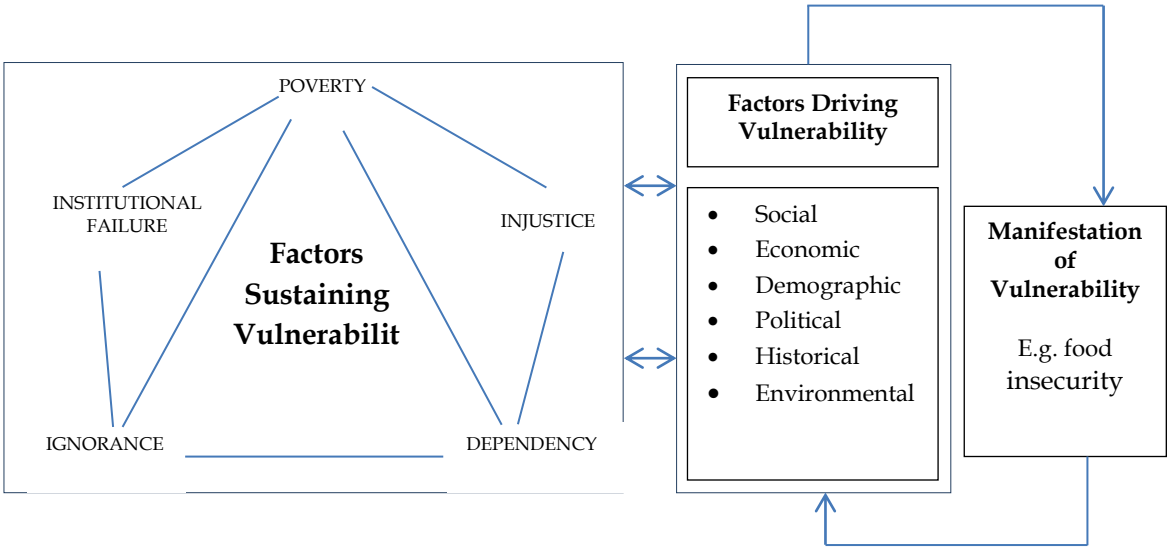
The results presented in Chapter Four and Chapter Six also showed that the factors that were sustaining vulnerability were highly persistent. The persistence of these factors was attributed to their capacity to resist the measures designed to eliminate them. For example, in the case of chronic poverty, sections of the targeted communities self-inflicted harm and preferred the identity of 'being vulnerable' in order to remain within the NGO food aid target groups. Further, they developed the language and local representatives to portray an image of being vulnerable, attractive to funding agencies. In some cases cited, even projects that were increasing vulnerability were left to continue as some of them had components that provided some short term benefit (e.g. tied to food aid) or were precursors for future projects. These factors rendered the state of poverty difficult to change. If resilience is defined as capacity to absorb disturbance and continue to develop, then the state of poverty may be seen as resilient given its resistance, and the fact that it was increasing in magnitude. In addition to poverty, several traditional practices that were rendering communities vulnerable to food insecurity were identified. Some of the local institutions, e.g. land tenure systems, had persisted for decades despite several political and social changes. In its current form, the land tenure system was seen as constraining uptake of adaptation technologies through its reduction effect on average farm size with population growth.

Thus, a critical analysis of the factors sustaining vulnerability concluded that these factors (poverty, ignorance, institutional failure and social injustice)

were in themselves highly resilient in nature. Through recognising that the state of vulnerability may be sustained by resilient processes and states, this thesis furthers the debate by suggesting that such conceptualisation provided a framework in which vulnerability and resilience could both be addressed. Scholars like Bunce et al. (2010), Miller et al. (2010), Nelson et al., (2007), and Milestead and Darnhofer (2003) have argued that resilience building should take into account the need to address vulnerability in order to prevent unintended costs to resilience in the long term. In seeking to contribute towards a more mature theory of resilience with practical applicability to practitioners seeking to promote resilient socio-ecological systems, this thesis argued that there is a need to identify the processes, practices and states that were resilient to change in a manner that was constraining people from responding to stressors as a starting point to understanding and building resilience while reducing vulnerability.

Figure 7-2 shows a revised (based on **Figure 2-6**) conceptualisation of the factors that produce vulnerability. It shows that while drivers expose the extant vulnerability, it is factors that sustain it over time that produce the state of vulnerability. The lines in the left component of the diagram show that the different factors sustaining vulnerability are connected with poverty having the most connections. The arrows generally represent the direction of the effect, e.g. the factors sustaining vulnerability influenced and were in turn influenced by the factors driving vulnerability. Subsequently, the drivers of vulnerability exposed the existing vulnerability, which in turn fed

back into the drivers of vulnerability. Food insecurity as a manifestation of vulnerability (and sustained by poverty) had an effect on environmental drivers (e.g. deforestation) which reduced the future resource base for coping with food insecurity.



Source: Author, 2012

Figure 7-2: Revised vulnerability context showing the factors sustaining, driving vulnerability and manifesting vulnerability in Malawi

In support of the conceptualisation of the relationship between vulnerability and resilience suggested in **Figure 7-2**, where some adverse practices and processes were seen to be resilient and thereby sustain vulnerability, the thesis identified evidence and reached a conclusion that the failure of development to address vulnerability or build resilience was rooted on the focus on intermediate factors, and not the root causes (Ch. 6 § 6.3.2.1). Likewise, the thesis demonstrated how current adaptation strategies aimed at reducing vulnerability to climate change had predominantly focused on the biophysical aspects (e.g. better seeds, water management) and fail to

address the root causes of vulnerability to climate change (e.g. weak market infrastructure, lack of labour, restrictive land tenure systems, poor soil fertility, restricted voice of the youth, despised local traditional knowledge, etc.) (Ch. 5, § 5.8; Ch. 6, § 6.3.4.1). It was argued that to build resilience, policy makers and practitioners had to acknowledge the existence of, and identify the various factors that were undesirable yet very resilient. This process would entail obtaining an understanding of the various cycles that were reinforcing the 'vulnerable state' and, by deduction, undermine capacity to respond and adapt. On this basis, the thesis argued that the normative view that resilience is desirable property of socio-ecological systems (Adger, 2000) had the danger of alienating the concept of vulnerability from the analysis. Rather, the evidence presented in Chapter Four showed that resilience as a concept should be understood beyond its normative value. Analysis of socio-ecological systems should recognise that resilience exists in its desirable and undesirable forms, where the former reinforces or sustains vulnerability, and the latter promotes response and adaptive capacity. Through an understanding of the processes and cycles that produce and sustain vulnerability, it is hoped that routes out of vulnerability may be identified and response and adaptive capacity enhanced. In this way, by reducing the resilience of undesirable processes and states the response and adaptive capacity is promoted, and through learning and transformation long term resilience is produced. This approach

links vulnerability and resilience and allows for both to be simultaneously addressed.

On the basis of the evidence presented in Chapters Four and Six and in light of the two concepts-resilience and vulnerability- this thesis concludes that the vulnerability approach, which emphasised pro-poor targeting for development, including adaptation projects, had over time positioned people as victims who required external resources to cope and adapt to various stressors. As a consequence of vulnerability-based targeting, some households displayed low motivation to protect themselves against shocks while others embarked on self-inflicted vulnerability in order to earn the identity of being "vulnerable". Motivation to adapt, innovate as well as aspire for self-sufficiency was all weakened for people rated vulnerable (Ch. 4 § 4.4.2). In fact, the study found that being rated as vulnerable was perceived as highly desirable as it enabled better coping (through food aid) and therefore, those rated vulnerable tended to ensure they remained in that state. In the context of the framework discussed above, vulnerability was made persistent and resilient to the various interventions seeking to eliminate it. In this regard, vulnerability was made a resilient and attractive state.

In addition to this, within communities the elderly, who were generally classified as the most vulnerable demographic group, lost the power and capability to actively engage within the community social and political

spheres, and the knowledge they embodied remained weakly tapped as a consequence of the vulnerability (read in the study areas to imply incapability) label. Indeed other factors such as social change, falling life expectancies, and migration, were also influential in hindering transfer of local traditional knowledge relevant for adaptation. This may suggest that the vulnerability paradigm has the danger of emphasising incapability and, therefore, influence regressive policies and fixes that fail to deal with the underlying challenges. According to Miller (2010) the policy interest in the use of resilience constructs, as opposed to the vulnerability paradigm, is based on the fact that resilience projects positivity and transformation.

Chapter four concluded that the experience of stress or stressors was associated with increased risk of vulnerability to food insecurity. This is the generally accepted position in the literature (O' Brien et al., 2004; Ericksen, 2008; Drimie, 2009). However the current study also found evidence to suggest that the experience of stress had a positive impact on food systems through enabling transitioning from otherwise highly resilient systems. Farming seasons following drought years were characterised by seed deficits, and in such situations, farmers were more willing to try new seeds or learn from extension officers. In other words, stress produced windows of opportunity for transformation and the attitude of the farmer determined prospects of such a transition taking place. However, forcing a transformation of livelihoods without dealing with the 'rules governing the

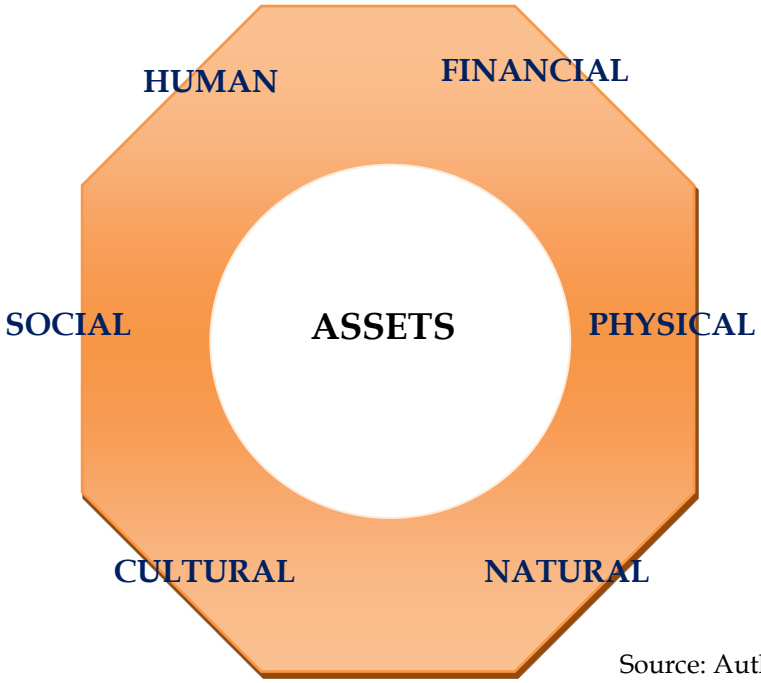
game', as seen with soya bean and dairy farmers in Mzimba, had the danger of exacerbating vulnerability to subsequent shocks, as well as pushing people towards poverty. The study also found that the transformation phase was the most sensitive to stress on the basis that individuals were often dealing with problems for which they had limited long term problem-solving experience.

7.3 Livelihood assets shape responses but ineffectively predict resilience

Asset based approaches dominate current thinking on what determines resilience to stressors at household and community levels. Keil (2008:304), for example, posits that wealthier households are less severely affected by drought than poorer households on the basis that they have more resources to liquidate. While this assertion was also generally true for the respondents interviewed in the present study, it appears to suggest that the poor were not resilient on the basis of lack of such material acquisitions. The results presented in Chapter Six suggested that the fact that even poor households were surviving very severe stresses, and also exhibited attributes consistent with resilient systems, such as learning, transformation, resistance and flexibility among others, demonstrates that they were, in their own way, also resilient albeit at a low output level. This finding raised the question: how should or could resilience be conceptualised within the context of poverty?

Considering the current drought coping strategies, it was concluded that transfer of assets to the poor within the framework of asset-oriented approaches to development and resilience building would not necessarily promote long term resilience. This conclusion was based on the observation made in Chapter Five (Ch. 5, § 5.8) that various financial and physical assets were being liquidated, often with low prospects of replacement, in response to stressors such as drought. Further it was demonstrated that some assets actually weakened the ability of households to transform or adopt new technologies e.g. wealthy households not taking up pro-poor targeted climate adaptation technologies.

Access to livelihood assets like livestock and land, (widely used as measures of vulnerability), did not always constitute resilience because there were other social rules governing their use. This means that the asset was not always 'available' or liquid to contribute towards the household coping or adaptive capacity. It was concluded that the asset framework should consider as more important the transferability of assets from one asset class to another, rather than the mere presence of the asset at the household level, when response/adaptive capacity is assessed. Failure to recognise this may lead to measures that erode resilience in the long term. **Figure 7-3** shows the original asset framework used in the current study and **Figure 7-4** the revised version that takes into account the findings of this study.



Source: Author, 2009

Figure 7-3: Framework showing the different livelihood asset categories required for enabling responses to shocks

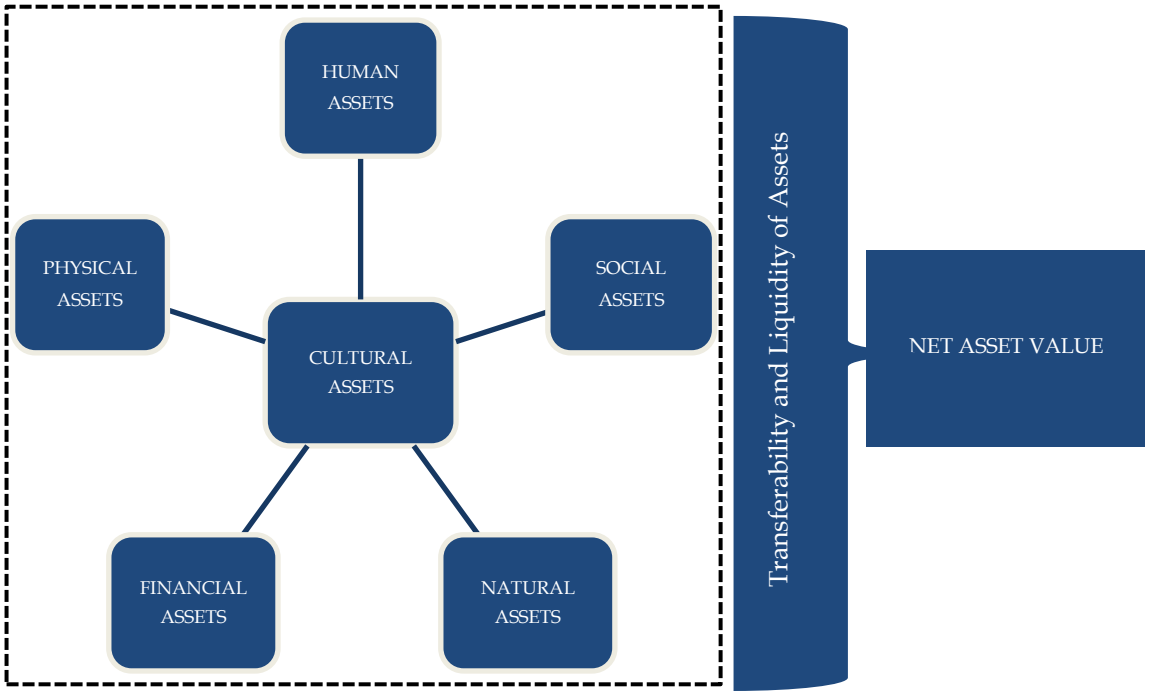


Figure 7-4: Framework showing the interaction between livelihood assets which enables responses to shocks

Figure 7-4 shows that different livelihood assets are related to each other and these relationships are mediated through culture. Cultural assets shape the transferability of assets from one form to another, and their liquidity and hence contribution to coping and adaptive capacity. Therefore, assets should be considered in terms of their 'net value', to be determined by estimating objectively how much of the assets available could make an actual contribution to response to stress. The research found that the value of assets available to households in determining resilience, as posited by Keil et al. (2008) and Alinovi et al. (2010) was both suppressed and over-estimated. Quantifying assets prior to a shock and associating these with resilience was inaccurate on the basis that these assets were lost in the process of producing the response to drought or other stressors (e.g. sold or exchanged for food), therefore, rendered unavailable for the subsequent stressor. This means that the resilience described, despite the better capacity to cope with drought stress, should be viewed strictly on a short term basis. Important questions on the role of livelihood assets in building more responsive systems emerging from this analysis are: "which assets are 'resilient' and what factors could sustain them?" Such an analysis would be of value to programs seeking to address poverty in the context of climate variability and change.

The results of the study suggest that associating assets with resilience may be problematic on the basis that some assets had the effect of excluding a household from adopting certain farming technologies especially those implemented behind a pro-poor banner. In other cases, assets like the hand

hoe and bicycle which were perceived as critical for ensuring resilience to drought, were in fact likely to entrap households in ganyu provisioning which was found to have high short term output but was detrimental to long term coping due to such effects as the inability to transform systems through hindered technology- uptake as a consequence of labour constraints.

Previous studies reviewed, such as Alinovi et al. (2010) and Cutter et al. (2008) found a positive association between both the availability of faith-based or public social protection measures and the size of social network with resilience. Evidence presented in this thesis argued that while social protection measures provide short term relief and food consumption smoothing, thus reducing the impact of stressors, they only serve a short term function and do not contribute to the long term resilience. The analysis presented in the last three chapters showed that measures implemented by these actors promote dependency and weaken self-sufficiency, innovation and limit opportunities for learning. The Hyogo Framework for Action 2005-2015 emphasises be seen in terms of what communities can do for themselves, their capacity to recover from disasters with limited or no external assistance (IFRC, 2004). The unpredictability of assistance, short term programming and focus on symptoms rather than their real causes were seen as some of the weaknesses associated with the role of social protection mechanisms. Respondents demonstrated that experiences of extreme hardship had been important learning curves, and had provided opportunities for transforming livelihoods and practices to new ones that

increased their survival chances. Social protection may hinder communities from reaching the tipping points, an important trigger for transformations, thus preventing opportunities for developing resilience. While this study concurs with the ecology school of thought which argues that to build resilience requires that systems are pushed to their limits, as shown by the transformation in diet and farming practices following the 2001 and 2005 droughts (Ch. 6 § 6.3.1.1 (1)), it also recognises that there are tricky ethical and humanitarian pressures associated with such an approach in socio-ecological systems. A number of questions on how we understand resilience can be raised here. For example, where should the boundary of a system be drawn? Should external actors like faith-based organisations be included or should the emphasis be on self-sufficiency? What exit strategies for humanitarian and developmental projects are appropriate for promoting resilience?

In terms of social capital, the current study concluded that while social networks generally offered support (e.g. psychosocial, food and labour), people tended to associate by socioeconomic group with the poor less likely to benefit much financially from their networks (Chapter Five). Some social ties and values, such as 'compulsory' funeral attendance, were seen as likely to expose households to droughts especially when they occurred at critical crop growth stages. This finding also suggests the need to understand the study context in order to determine the extent to which various indicators can be meaningfully applied to understand resilience.

The effect of context in the understanding of resilience was demonstrated in the analysis of the role of education. Like Keil et al. (2008), the current study did not establish a direct association between education and resilience. However, it was shown that as the highest level of education of the head of household increases, so did the likelihood of non-agricultural income. Formal employment was associated with use of farming technologies such as hybrid seed and fertiliser, seen as more appropriate for short seasons. Such a linkage therefore, demonstrates the benefit of using mixed methods research and analysing the context of the study area robustly.

Basing on the evidence presented in Chapter Five, this thesis concluded that livelihood assets were not always effective predictors of resilience. The application of assets in analysing resilience depended on specific contexts. Current approaches which embrace the asset approach, such as the model used by Alinovi et al. (2010), tended to be static in nature and therefore less able to assess long term resilience. Static models that do not recognise how assets change over time are likely to arrive at wrong conclusions about the level of resilience.

The assertion by Agrawal (2008) that differential access to institutions influences adaptation to climate change was found true and applicable to the study areas covered by the current thesis. The socioeconomic status of a household had a substantial influence on household access to strategic resources (e.g. land in the flood plains and stream banks), which in turn shaped the household's drought coping and adaptive capacity. However, it

emerged from the study that some of the practices that ensured resilience to drought for the richer households, such as stream bank cultivation, had medium and long term costs for the community at large, e.g. increased flood risk due to siltation, which affected the poorest the most. It was concluded that resilience in such contexts was achieved by some households at the expense of others. Furthermore, the pursuit of short term goals by such actors as the agricultural extension department in the study areas, allowing for the use of marginal and ecologically sensitive areas such as stream banks, tended to overlook the long term sustainability of livelihoods and erode resilience overall.

The use of the various assets owned by households and the approaches to decision making in response to drought and other stressors was influenced by a range of cultural factors. For example, the liquidation of strategic assets like livestock in response to drought was much lower than expected in a pastoral community such as those encountered in Mzimba. Livestock played a cultural function in payment of dowry and also represented wealth and influence. As such, mere ownership of cattle within a household did not automatically qualify a household as better placed to respond to drought stress because cattle held other social values, including payment of dowry and as a status symbol. Thus, value systems present challenges in terms of shaping how people respond when faced with adversity.

Some studies have argued that there are cultural limits to adaptation (Adger et al., 2009). This thesis, however, concluded that cultural practices, norms,

beliefs and values do not the limit to adaptation *per se*. Evidence presented in Chapter Five showed that while "culture" was attributed as the main constraint to "progress" in terms of the adoption of new technologies, including those designed for climate change adaptation, it was in fact the failure by practitioners to understand the complex environment and the salient factors shaping capabilities to take up promoted measures that was the bottleneck. For example, while the perceived resistance to shell maize prior to storage (so as to optimise keeping quality) was dismissed as a traditional practice by extension officers and some community members, closer examination through in-depth interviews at household level revealed that the lack of adequate labour for crop produce processing, given the need to participate in ganyu at the same time, was the underlying reason (Ch. 4 § 4.4.2; Ch. 6 § 4.4.2). Furthermore, the study concluded that there was a combination of a general failure on the part of the conservative respondents to analyse the context within which some of the traditional and local practices were used and ignorance on the existence of alternative ways that could better promote more secure livelihoods and food systems. In some cases it was the lack of finance that was hindering use of various promoted techniques. In the context of the study areas, the perceived resistance to external knowledge and tools were seen as a protective mechanism that reduces the exposure of locals to systems that could potentially expose them to stresses beyond coping range (e.g. volatile seed markets). For the study population, households using traditional maize seeds were better able to

replant following poor crop emergence due to dry spells, compared to those who used market purchased hybrid seed, and therefore were more food secure. This speaks to the effect that culture had a protective role, and actions taken within the traditional approaches were based on a more grounded, even though weakly analysed or discussed, understanding of local realities. The initial resistance to new technologies particularly in Mzimba meant that risks associated with new technologies for which there was minimal institutional memory in trouble-shooting, were contained. The slightly better-off households who emerged as early technology adopters would provide a test group against which the rest of the community would assess if the new ways of doing things were viable given their circumstances. In this regard, cultural resistance acted as both agency (allowing for some level of self-determination and identity) and social protection (through resisting potentially non-viable options). The ability to resist and question new knowledge based on locally upheld traditions and culture had the effect of contributing to resilience. This finding demonstrated the potential contribution of cultural values to resilience, through understanding cultural resilience as influencing food system resilience.

7.4 Rethinking resilience in the context of food systems

The aim of this thesis was to contribute to resilience theory through exploring its applicability in the analysis and management of food systems facing increasing drought and flood risks due to climate change. The

findings presented across the three results chapters indicate that there are a number of loose ends that should be considered if this theory is to be applied in theory and practice. This section identifies some of the current issues and potential avenues for further enquiry.

One of the key weaknesses of the current conceptualisation of resilience identified in the review of literature was the reductionist approaches in which scholars have a tendency to focus on only one or a few often closely related attributes of resilience in assessing the factors producing resilience, and derive from such analysis conclusions about the resilience of whole systems. Holling (1973) focused on stability and persistence, although his later work (Gunderson and Holling, 2002) incorporated other attributes such as transformation. Timmerman (1981) and Pimm (1984) focused on recovery, while more recent scholarly work by Walker et al. (2004) and Folke (2006) promoted transformability or renewal as the main attributes of resilience. Klein et al. (2003) and Adger (2005) see resilience in terms of social learning capacity and Twigg (2007) cites the Hyogo Framework's definition of resilience as self-sufficiency. Flexibility as an attribute of resilience is the focus of work by Pickett et al. (2004).

The literature review in Chapter Two demonstrated that the multiple perspectives or attributes of resilience need not be viewed separately: together they offer a more comprehensive and system-wide understanding of the factors producing resilience. The schematic model presented in **Figure**

2-1 sought to illustrate the interconnections between the different attributes, and this model was applied to local food systems to explore the conditions that made some households more resilient to disturbance than others. The results presented in Chapter Six confirm that more flexible and fuzzy definitions of resilience, as suggested by Strunz (2012) would allow for trans disciplinary and interdisciplinary conceptual understanding and thus enhance what could be knowable about a given system. The results presented in Chapter Six showed that in different contexts, the capability to learn, level of flexibility, ability to exercise individual or collective agency through resisting measures deemed inappropriate for local situations, and the willingness to allow for transformations to take place where necessary, ultimately determined the resilience to disturbances. It was also shown that while the four attributes above had a determinant influence on the level of resilience to disturbances such as drought, other attributes including stability, persistence, self-sufficiency and recovery capacity had value after the disturbance had been observed. Thus, while conceptual clarity is of importance for the development of a resilience paradigm, the results indicate that such a paradigm would evolve from the recognition of the multiple perspectives of resilience rather than emphasising a single attribute.

The results presented in Chapter Five indicated that livelihood assets accessed and owned at household level influenced the level of household resilience to drought through shaping the internal capability to respond to

stressors. Access to specific assets was seen as enabling the possibility of a range of response options, transformability and reorganisation within the system, and learning to ensure continuity over time. Chapter Five showed that livelihood assets are critical for determining the level of household resilience to drought. However, current thinking on resilience in socio-agro-ecosystems does not show how resilience should be conceptualised or understood under conditions of poverty and low asset ownership.

The view that the poor and food insecure lack resilience characterises the current discourse on resilience thinking especially in the field of international development.

The current study showed that there were, however, other non-material values without which resilience could not be achieved. Peoples' culture, worldviews, habits, norms, beliefs and knowledge systems formed an important branch of resources for enabling survival. However, the results also showed that even those with little access to material resources had survived some of the worst droughts and floods. On closer examination, in Chapter Six it was shown that across socioeconomic groups individual households exhibited to varying degrees the different attributes of resilience. The manifestation of the attributes of resilience at different socioeconomic scales, also differentiated by food consumption levels, indicated that the meaning of resilience across the study group was different for different social groups and households based on differences in desired outcome of resilience and factors promoting resilience at that level.

Based on the discussion above, four key conclusions are drawn by this thesis. Firstly, the reductionist perspective applied in resilience studies limits what can be known about the resilience of socio-ecological systems. By applying the schematic model which take into account the multiple attributes of resilience (**Figure 2-1** and **Figure 6-3**), a more comprehensive understanding of the factors shaping resilience was obtained than would have been obtained from using a single attribute of resilience. Secondly, the dominant approaches in resilience scholarship that focus purely on the normative aspects of resilience have had the unintended consequence of weakening possibilities for developing linkages between vulnerability and resilience. By defining resilience as a desirable quality in socio-ecological systems, this thesis demonstrated (Chapter 4 and Chapter 6) that the focus is shifted away understanding the undesirable forms of resilience which generally reinforce and sustain vulnerability. Failure to address vulnerability issues in building resilience leads to fixes that fail as evidenced by some of the NGO and government programmes, including protracted food aid in Nsanje. Thirdly, resilience should be understood as meaning different things to different people, and the question of whose values matter in determining what is resilient and what should be done should be raised in all efforts that seek to promote resilience. In Chapter Five it was shown that poor households with limited physical assets had "nothing" to lose in a drought (materially) while richer households were more concerned about recovering livestock or other similar assets in the post-disaster era. Fourthly, too many measures and

perspectives renders the theory complicated and confusing. The review of literature presented in Chapter Two demonstrated that different disciplines had different priorities, interests and approaches to measuring resilience. As a consequence, there is no universally accepted framework for measuring resilience. This thesis identified the different attributes and frameworks for context analysis that could form a useful starting point to analysing resilience or building indices with respect to agricultural and food systems. It also demonstrated the challenges with quantitative measures which may not mean much if such measures are based on weak understanding of the whole system or lack of appreciation of the complexity of the challenges. Most importantly, it showed how resilience and vulnerability could be simultaneously analysed and addressed in policy and practice.

Practitioners and policy makers are concerned about how targets and progress in building resilience in socio-ecological systems could be measured (Carpenter et al. 2001:766). The notion "if one cannot measure *it*, then how can they know that they have changed it?" has generated pressure to identify indices and measures of resilience as shown by the proliferation of literature in the subject (Twigg, 2007; Alinovi et al., 2011). The findings of this study, however, raise questions on whether measuring resilience should be a priority after all. In addition, questions are raised on whether resilience is the outcome of interest that should be measured given that it (resilience) is demonstrated over a very long time through which communities experience multiple episodes of stress, recovery, learning and transformation, versus the

very short terms through which resilience building projects run (typically three to five years). In addition, the critical analysis of the role of assets and context in determining resilience showed that any proxies for resilience are likely to be applicable at a highly localised scale, and even at that scale still remain questionable given the wide variation in 'what would make a household resilient ?' from one household to the next. Questions that would have to be dealt with would relate to who defines what is resilient and what is not; what are the reasonable time and spatial scales; what constitutes the system and where are the system boundaries; which shock or shocks should be considered and for whom is resilience being promoted?

The findings of the present study question the rationale for specificity in the demarcation of the system of interest and the stressor of concern in the measurement of resilience as suggested by Bennett et al. (2005:946) and Carpenter et al. (2001). The results presented in Chapter Four showed that respondents in the study areas were not only susceptible to a single stressor (drought), but rather, they had to deal with multiple stressors some of which acted concurrently or in sequence. In the case of Nsanje, relevant stressors other than drought included floods, market price fluctuations and social changes. It was shown in Chapters Four and Five that households that failed to adequately adapt or cope with floods had low levels of resilience to drought because of the tendency to suffer from the economic impacts of floods and thereby fail to take advantage of the positive benefits that floods

generate. Thus, resilience to drought in Nsanje was better understood and predicted on the basis of household resilience to floods.

Further, the results presented in Chapters Four and Five demonstrated that the attainment of food security as an outcome of food systems relied on factors operating outside the food system, even though some of these were closely linked. For example, it was demonstrated that food security depends on resilient seed systems and therefore a resilient seed system is an essential component of a resilient food system as it ensures adequate seed supplies despite any possible market or climatic stress. In addition, agricultural soils were also subject to multiple biophysical stresses due to pressure from various elements including floods, drought and wind action. The ability of agricultural soils to retain nutrients, maintain desirable biophysical and mechanical properties was rooted in management systems but largely reflected in the soil's resilience. As a consequence, vulnerability to drought was found to vary among people of different soil types given the differentials in capabilities for food production they possessed. By being able to retain essential minerals like iron, resilient soils were seen to contribute towards health resilience of food consumers through ensuring that harvested food had sufficient nutrients to support healthy living. It was also argued that a resilient cultural system, one that has the agency to resist changes detrimental to long term coping capacity and the flexibility that allows for adaptive management and transformation, was an integral component of resilient food systems. Consistent with Adger (2000) who examined the

connections between social and ecological systems, the results of this study show that the ability to retain specific cultural values and knowledge over the long term was essential for promoting ecological resilience. On the other hand, ecological resilience formed an important element in social responses to environmental change. These interdependencies show that measurement or prediction of resilience should focus not only on the specific system of interest, but should take into account the resilience of other connected systems.

Chapter Five focused on the effect of livelihood assets on household resilience to drought. The chapter concluded that contrary to positive associations between access to assets and outcomes consistent with resilient systems as reported by Cutter et al. (2008), Alinovi et al. (2010) and Keil et al. (2008), livelihood assets were only seen to produce resilience under particular operating contexts. It was further shown that reliance on livelihood asset-based indicators had the danger of giving an illusion of resilience. Across all results chapters in this thesis, it was demonstrated that *ganyu* casual labour provided short term coping capacity but not necessarily the capability of being resilient in the long term. In fact ganyu was shown as an example of one coping strategy that allowed short term gains at the expense of long term resilience, e.g. by weakening the capacity to transform the farming system through technology adoption. Thus, while one asset e.g. access to labour, may be viewed as consistent with resilience, analysis over a longer time scale may yield different outcomes. In the case of the study area

this suggests that measurement of resilience should take into account the 'when' or temporal scale on which conclusions about the state of resilience are being reported. Thus, resilience to a stressor may be understood by observation of system behaviour to adversity over a long period of time. As such resilience should be understood as a long term goal of managed systems that cannot be achieved over a typical three year project period, but one that individuals and communities learn themselves through continuous learning and transformation

7.5 Contribution of this thesis to resilience theory

This thesis makes several contributions to resilience theory particularly with respect to socio-ecological systems. The thesis concludes that resilience, like vulnerability and adaptive capacity, is an inherent property of socio-ecological systems. Differences in capacity to maintain response capacity and continue to develop should be understood in terms of differing levels of resilience, a product of the context within which such responses are being made. Importantly, the analysis of resilience, wherever such becomes necessary, should address the question: whose perspective really matters in terms of what is resilient, why and for whom? This thesis concludes that as an inherent property of socio-ecological systems, resilience cannot be made or destroyed: its expression in desirable or undesirable state is determined by the context and the aims of the analysis.

The reductionist perspective of resilience that dominates literature on resilience has had the effect of confining resilience theory to academia, with rhetorical application in real-life management of food and other socio-ecological systems. The academy should focus on exploring further synergies that can be fostered across academic disciplines, especially the inclusion of psychology and business management, in order to promote the maturation of this theory. In its present state, the theory of resilience remains too complex and subject to many interpretations. While applying the basic principles of resilience theory enable more effective understanding of complex systems, a lot of groundwork needs to be covered before this theory has value to practitioners. Part of the problem rests with the obsession by practitioners and policy makers to measure, and the argument that if certain phenomena cannot be measured then they cannot be changed. With resilience, given its multiple dimensions as shown in this thesis, there is a clear need to think about whether it is resilience that should be the focus of measure, or maybe some other outcome, such as response capacity. This thesis concludes that if focus is accorded to building response capacity through addressing the 'undesirable resilience' within some systems, e.g. re-focusing on poverty reduction which became a lost agenda following the climate change adaptation bandwagon, addressing inequality and social injustice, strengthening institutions and establishing market infrastructure, addressing soil infertility and reducing ignorance through capacity building, we can achieve measurable progress. If policies to deal with these

underlying issues are 'resilience-oriented', i.e. recognising that people have capabilities, promoting innovation and self-sufficiency, ensure flexible management structures, and discourage dependency, then people can learn themselves into resilience.

A comprehensive understanding of resilience should take into account the fact that the resilience of a system is a product of the relative resilience of its components. Resilient seed, market and transport systems, for example, are primary in determining the resilience of the food system overall. Resilience, however, should not be viewed only as a normative attribute; by recognising that there are some highly resilient though undesirable states within systems of interest, we can identify more robust mechanisms for building response capacity while dealing directly with the underlying causes of vulnerability.

This thesis also concluded that efforts to build resilience need not focus on a specific stressor, because the system is exposed to multiple stressors and resilience to a specific stressor does not imply resilience to other stressors. A resilient system should be capable of dealing with a broad range of stressors. Perhaps an important challenge lies in applying resilience in practice is the long term range within which a system should be analysed for resilience, and the short term policy and project intervention cycles. This raises the question as to whether the purpose of policy should be to build resilience, or improve capacity to respond (a more objectively measurable goal). It is clear from the discussions here that policies that address the underlying causes of vulnerability will enhance capabilities to respond to drought and other

stressors. At individual, household and community levels, people can eventually learn themselves into resilience. Indeed by taking advantage of the positive energy generated by the term 'resilience' it is possible to re-engineer agricultural development and development assistance in favour of a more locally driven process aimed at building self-sufficient communities that can live with change. Resilience, therefore, cannot be seen purely on the basis of bouncing back or bouncing forward in response to hazards, but rather the agency, or the ability to exercise their power (Giddens, 1984), that people have to articulate and address the institutional and other constraints that limit their capacity to respond positively when faced with adversity.

7.6 Re-examining the schematic model for understanding resilience

Figure 7-5 is a schematic model that represents the relationship between the concepts of vulnerability, adaptive capacity and resilience within the context of household and community level food systems. This schematic model (Fig. **7-5**) is a revised version of the model initially presented in Chapter Two (**Fig. 2-6**) and it takes into account the findings and conclusions of this thesis based on analysis of empirical evidence from fieldwork in Malawi. With regards to the overall structure of this thesis, this schematic model answers to Objective 4 of this study, which is "to analyse the utility of the concept of resilience and develop a conceptual model illustrating the relationship between vulnerability, adaptive capacity and resilience".

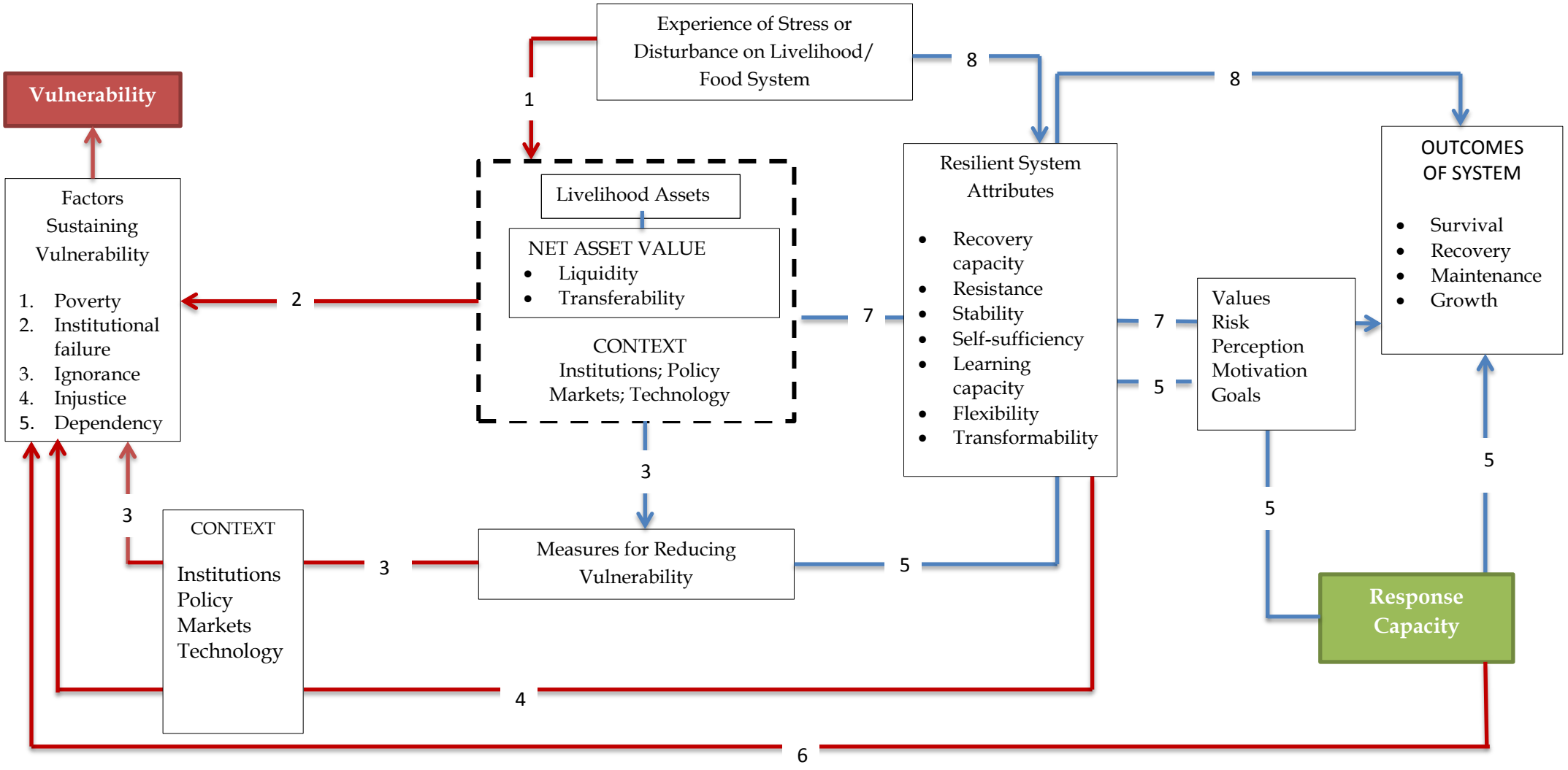


Figure 7-5: Revised schematic model for evaluating resilience

The relationship between these three concepts was analysed with respect to the experience of stress (in this case drought) on the food and linked agricultural system. Pathways leading to undesirable resilience (which reinforces vulnerability, for example) are shown in red, and those leading to 'desirable' resilience are indicated in blue links and arrows.

The study found that stress had both direct effects on household livelihood assets (e.g. sale of land to buy food) and indirect effects (e.g. migration of household member leading to inadequate farm labour and high risk of contracting chronic illnesses associated with spousal separation). This relationship is indicated by (1) on the schematic model. Loss of various livelihood assets was associated with increasing level of vulnerability (e.g. as indicated by the experience of food insecurity). Losses in assets experienced in this way (e.g. loss of educated, skilled and able-bodied people to migration or illness), reinforced the very factors that underpinned vulnerability (e.g. ignorance and poverty due to above losses).

Livelihood asset losses should be considered within the context of extant institutional, policy, market and policy arrangements (2) that sustain vulnerability. As an example, access to credit (i.e. financial assets) had led to high indebtedness for some households studied, and this had exacerbated than alleviated their poverty leading to increased poverty because the consumers were not adequately protected through effective policy and market infrastructures. Some assets (e.g. livestock or houses) were neither liquid nor transferrable to other forms, and rendered their owners more vulnerable to food insecurity since they could not be assisted by different organisations (being seen as rich because one owned a house with iron sheet roofing). In the study areas there was evidence of planned and autonomous actions aimed at reducing vulnerability at the household and community levels and

involving both internal and external actors. Some of the measures that were being promoted to 'reduce vulnerability' appeared to, on the contrary, promote a culture of dependency, undermine local innovation and reinforce poverty instead of promoting more effective responses to future shocks. Evidence presented in this thesis demonstrates that some measures and approaches, e.g. targeting households that have experienced flooding with food and other aids, tended to render the state of being 'vulnerable' attractive.

There is also evidence of what appears to be **resistance** to measures that seek to 'reduce their vulnerability'. Some households and communities have **learned** the 'rules of the game' in dealing with NGOs; as well as **flexibilities** and **stabilities** within the food and livelihood system that sustain the state of vulnerability. This thesis argues that the attributes of resilient system equally apply to understanding why vulnerability is persistent. This means that there are factors that render vulnerability a highly resilient state (3). These factors can be understood through an analysis of the institutional structures, policies, markets and technology operating across different scales (from individual to national) against the various attributes of resilient systems (4).

There were other cases however, where asset dependent measures aimed at reducing vulnerability did in fact lead to an improvement in the capacity to respond to stresses. Households and communities that demonstrated learning (e.g. by switching to cassava following droughts) and flexibility (e.g. rules governing land and water access) had better capacity to translate assets available into more effective responses to stress (5). Thus, they were capable of coping and adapting to stresses such as drought and these responses were being made within the context of local values, risk perception, goals and motivations. It was argued in this thesis that

households and communities that were capable of displaying the various attributes associated with resilient systems had a higher capacity to respond to stress. Repeated success in responding to stress indicated resilience of those particular households and communities.

In some cases surveyed, evidence suggests that some measures to promote positive resilience (response capacity) worked but only for a short period of time. Strategies such as dependency on ganyu labour often resulted in slightly higher food and income for farmers engaging in the practice compared to those without access, but in the long-run appeared to undermine the resilience of those households and communities (e.g. through failure to take up technology for adaptation due to lack of labour). Such loss in capacity to respond was associated with high risk of progression towards a state of vulnerability (6).

Figure 7-5 also shows that livelihood assets, in particular the 'net asset value' derived from the gross asset base less the level of transferability and liquidity of those assets (mediated through cultural and other factors), interacted with the local value systems, risk perception, motivation and household goals to produce different meanings of resilience for different people. Households associated with low net asset value tended to understand being resilient in terms of survival, albeit with some acceptable levels of loss; those with some few assets saw themselves as resilient if they were capable of recovering the assets lost; and the better off and rich households valued either maintaining what they had or expanding as a consequence of the experience of stress (7). Expansion, for example, was possible through purchase of land from poor households trying to survive a drought. Thus, the resilience of some could be achieved at a cost to others. Importantly, it was also concluded that the experience of stress was necessary for probing the system and

providing an incentive for internal adjustments that would allow the system to deal with similar to larger stresses in the future. For example, drought led to **learning** about food saving, and **transformed** people's perceptions of some crops (e.g. cassava which was not grown or consumed by some farmers before the drought). Learning and transformation are two of the various attributes that resilient systems need obtain.

On the basis of the discussion above, this thesis argues that resilience exists in two forms: as desirable or as undesirable. In its desirable form, resilience results in higher response capacity whereas in its undesirable form resilience will tend to reinforce the factors that sustain the state of vulnerability. This does not mean that the two, resilience and vulnerability are opposites since they measure and are measured through different ways as this thesis has demonstrated. It had been argued in this thesis that appropriate measures for promoting resilient food systems and livelihoods (which deliver food security and secure livelihoods) would have to achieve two things: reduce vulnerability by addressing the factors that sustain vulnerability on one end (recognition that some of the factors are highly resilient in themselves), and promoting measures that increase the system's capacity to respond to stresses, and consistently achieve this positive response capacity over the long term.

The interrogation of the three key concepts in this study; vulnerability, adaptive capacity and resilience, yielded a range of questions which are postulated to be of use for any decision maker intending to apply resilience as a way of addressing livelihood goals. The list is not exhaustive but acts a guide against which decisions to apply resilience can be made:

Table 7-1: Suggested Questions for Assessing Resilience

Resilience	• How is resilience being defined? • What should a resilient system do or look like? • What are the appropriate time, spatial and governance scales for analysing resilience? • Why is a resilience approach being used? Are there any specific motivations? • What does resilience mean to different people? • Who defines what resilient is and why? • What are the positive and negative forms of resilience? • How can the positive resilience be promoted, while tackling the negative? • For which stresses is resilience built? • Which attributes of resilience are relevant? • Which stresses promote resilience, in what contexts?
Vulnerability	• What processes, practices and institutional structures make people vulnerable to stresses? • Of the factors identified above, which ones are resilient or sustain vulnerability? • What interventions could allow people to break out of the cycles that keep them vulnerable? • Who is vulnerable and why? • Do approaches to assessing vulnerability reinforce certain stereotypes that undermine agency? • What is the effect of stress on vulnerability? • What is the process by which impact occurs? • How does frequency of stress and magnitude affect coping resources, knowledge, perceptions, values? • Which stresses are prioritised and by whom? • How do these stresses affect linked systems? • What combination of stresses produces substantial impact?
Adaptive Capacity	• What assets do people have? • Which assets enable positive coping and adaptation, and which ones constrain coping? • Are these assets liquid or transferable such that they constitute response capacity? • Which assets make people vulnerable, and how does this happen? • What assets could reduce vulnerability? How can such assets be delivered while ensuring self-sufficiency? • What coping and adaptation strategies are available? Which ones promote response capacity, and which ones have the risk of undermining future responses?

However, output from such evaluations needs to be treated and interpreted correctly, since positive responses may not necessarily be repeated in the future as context within which stresses are experienced change. In addition to exposing existing vulnerability, the schematic model shows that stress also contributes directly to vulnerability through reducing the resource base available for responding to shocks (e.g. physical assets, knowledge, hope and self-determination). Such losses initiate employment of coping strategies, some of which have the effect of reinforcing the vulnerable state thus making vulnerability resilient. While assets are important in shaping response capacity, depending on how the context influenced their value, the thesis argued that some assets led to an increase in vulnerability as they limited capacity to use some of the available routes for coping and adapting to adverse conditions. Assets were also seen to produce (and be produced by) social groups within communities. On the basis of realities and priorities within these social groups, the meaning and motivations of resilience varied substantially. Consequentially, different households had different constraints to achieving 'resilience', thus raising the question of "whether one-size-fits-all" projects may effectively deliver resilience.

7.7 Recommendations for policy and future research questions

The term resilience is increasingly being adopted as a goal by policy makers and practitioners operating across a wide range of systems. This thesis

argues that this popularity of the concept of resilience is despite the fact that the theoretical and philosophical foundations of the concept remain weak. To prevent pitfalls associated with fixes that fail, a number of recommendations for policy makers and practitioners are proposed with regards to application of resilience theory in management of socio-ecological systems. The research agenda for future scholarly work into resilience in food systems is also outlined in this section.

Measures that seek to address resilience should question whether making the system resilient at its current level (e.g. current food availability and consumption level; current income levels, etc.) is a desirable thing in the first place. The priority should be the raising of quality of life, and then responsive systems can be built, as compared to accepting a low quality of life and investing money just to prevent the situation from getting any worse. It should also be taken to note that resilience is not always a desirable attribute as it may hinder some transformations from taking place. Further, by seeking to understand the undesirable forms of resilience within systems, opportunities for policy to address the underlying causes of vulnerability could be enhanced.

In the case of Malawi, a country seeking to build resilience in the agricultural sector so as to ensure food security, while national level policy reforms that would enable promotion of local innovation and limit restrictions on farmers are necessary, local level adjustments based on an understanding of local

context would generate higher impacts on response capacity to droughts and other stressors. Such initiatives as a local grain bank, water bank and seed bank could propel communities towards more resilient futures. However, the success in delivering such programmes depends on putting the communities first and being driven by local passion, interests and focus. Simultaneously, pro-poor targeting of interventions requires a rethink in order to deliver development more effectively.

While resilience may appear as a desirable quality of socio-ecological systems, it should be noted that different people attach different meanings to the term given differences in resource ownership, influence over institutions, goals and general capabilities. As a result, measures to promote resilience should recognise that one-size-fits-all approaches will not work in resilience building: decisions will have to be made in terms of appropriateness of scales e.g. individual to household to community depending on intervention. At the same time, a rethink on whether pro-poor programming is the best modality, given the observation that the ability of the poor to survive is tightly dependent on the survival chances of the richer neighbours, is required.

The theoretical and measurement weaknesses associated with resilience as a construct do not imply that we should abandon the concept altogether. Rather, policy makers and practitioners should take advantage of the positive energy that the term embodies to restructure agricultural and food

security policies. In this case, resilience should not be seen only as state or outcome, but rather an action word that inspires a restructuring necessary to address what is currently wrong with the current flawed but dominant approach. Policy makers may retain the term resilience to reflect the long term goal but, in practice, focus on what really matters-increasing the capacity to respond to multiple stressors- an aspect that can be measured and analysed over time.

The discussions in this chapter reflected clearly that resilience theory is still at a developmental stage and subject to multiple interpretations, measurement and applications. The academy has an opportunity to contribute towards the development of a resilience paradigm through generating case studies where the concept of resilience has been applied and mapping out what defines resilience in socio-ecological systems and on what basis such claims can be made. Further, with respect to human systems there is a gap in the linkages between resilience thinking in psychology and the socio-ecological systems research. Bridging this gap would enable an understanding of resilience at the scale of the individual in socio-ecological systems through elucidating on the processes and factors that shape perception of risk, motivation to adapt and effectively, type of responses used. Whole systems theory, in contrast to reductionist approaches should be promoted if resilience theory is to offer solutions for risk management. Approaches should foster thinking in dynamic rather than static systems and should not be confined to material entities only.

In consideration of the subject of culture, and in light of the fact that resilience, perhaps like other concepts such as vulnerability and adaptive capacity, is being studied mainly on the basis of western philosophy, there is scope for examining the value that traditional African worldviews and philosophies could play in both the understanding and management of food systems for resilience. Africa will achieve development when it finds solutions from within its rich culture.

Some of the specific questions that should be addressed by future research include the following:

1. What are the social thresholds in relation to resilience to multiple stressors, including drought, and how can an understanding of these thresholds inform disaster risk reduction and adaptation planning?
2. Is there any merit in using the process of assessing community level resilience to 'sow the seeds of resilience' within communities?
3. Who participates in community social meetings, and why does this matter for research into resilience?
4. What development model is most suited for taking into account the needs of the poor while addressing community-wide goals? What is wrong with pro-poor targeting in climate change adaptation and in delivering long term resilience?
5. How is the climate change message being communicated at community level? How do messages about the causes of climate

change influence motivation of individuals to protect themselves through adaptation?

6. Can psychological resilience based on individual life experiences be transferred be transferred from social experience to adaptive management?
7. Can change management principles from human resources management be applied in promoting changes in attitudes to climate change adaptation? Is it a good thing to change peoples' attitudes, or this may undermine their agency given their often deeper contextual understanding?
8. What framework for development organisations would create the space within which actions that promote resilience are taken?
9. What can be learned from African philosophy, world views and culture that could enhance adaptation and help promote resilience?
10. What are resilient institutions, and how are they made?
11. To what extent are household head characteristics useful in understanding household-related phenomena?

7.8 Conclusion

There are no smooth-edged conclusions to the question "what determines resilience to drought in food systems facing increased risks due to climate

change?" Some of the prominent conclusions reached by this thesis which are intended as a contribution to resilience theory are:

1. Resilience is an inherent property of all socio-ecological systems. It should be understood as existing in two forms, the desirable form (which enables effective responses to stressors), and the undesirable form (which sustains the vulnerable state thereby creating an environment in which responses do not produce intended outcomes). By attending to the factors that sustain vulnerability, the ability of a system to respond to stressors is enhanced. This conceptualisation of resilience links vulnerability to resilience and therefore allows for both to be simultaneously addressed.

2. Resilience as a concept has multiple meanings to different people and social groups. As such, the determinants of resilience should be understood on the basis of how resilience is defined by the individuals or communities studied, what they value, the differences in context, and the time scales considered reasonable for assessing subjects studied against agreed on attributes of resilient systems.

3. Livelihood assets have an influence on capacity to respond to stressors. However, considering asset ownership as a predictor of resilience should be based on an understanding of the long term changes in asset availability and value, as well as the liquidity with which assets may be converted into adaptive or response capacity. Some assets may promote

vulnerability. Asset ownership, however, cannot be directly correlated to resilience given that the meanings of resilience and the contexts within which resilience is expressed vary largely.

4. There are a number of challenges associated with applying the concept of resilience as well as its measurement. This thesis concluded there is a need to move away from how to build and measure resilience, towards more realistic goals of enhancing response capacity through assisting communities build self-sufficiency in addressing the factors that sustain vulnerability and limit their agency to respond to stresses. Over time, people will learn themselves into resilience. The focus on resilience is yet another top-down approach which will only exacerbate vulnerabilities if not carefully managed.

5. The concept of resilience within the international development framework has the potential for addressing some of the wrongs within the current architecture of aid and development. By emphasising self-sufficiency, projects promoting 'resilience' may be required to demonstrate how communities will continue without external assistance, leading to more sustainable solutions. Further, by considering people as having internal resilience instead of being vulnerable, as dominant approaches emphasise, the concept offers an opportunity

6. Approaches to promoting resilience should focus on multiple stressors rather than specified stressors (e.g. drought) on the basis that a system with resilience to drought will not automatically have resilience to floods, but will inadvertently be disturbed by both. It is important that labels to ensure that conclusions about resilience take into account the temporal scale and the likely changes (e.g. demographic, resource base).

7. The overall resilience of a system is summative of the relative resilience of its different components and the resilience of other systems connected to it. Resilience to drought may depend on resilience to floods or market shocks. In the case of food system resilience, one may consider the resilience of seed systems, soils, culture, etc. as pertinent. Resilience perspective, despite existing limitations, is a very useful systems-oriented way of understanding complex problems.

8. Resilience can be defined as the capacity to maintain capacity to respond to multiple stressors over reasonable time frames and based on local values, priorities and meanings. On the basis of generic definitions of resilience, building resilience for one social group may lead to a reduction in the level of resilience for another group.

References

Adair, J.G. (1984). The Hawthorne effect: A reconsideration of the methodological artifact. *Journal of Applied Psychology* **69** (2): 334-345. doi: 10.1037/0021-9010.69.2.334

Adger, W. N. (2000). Social and ecological resilience: are they related? *Progress in Human Geography* **24** (3): 347-364.

Adger, W.N. (2003). Social capital, collctive action and adaptation to climate change. Economic Geography; October 2003, 79(4): 387-404.

Adger, W. N. (2006). Vulnerability.*Global Environmental Change* **16**(3): 268-281.

Adger, W. N., Arnell, N. W., Tompkins, E. L. (2005). Successful adaptation to climate change across scales. *Global Environmental Change* **15** (2005): 77–86.

Adger, W. N., Kelly, P. M., Winkels, A., Huy, L. Q.,Locke, C. (2002). Migration, remittances, livelihood trajectories and social resilience.*Ambio***31** (5): 358-366.

Adger, W. N., Brown, K., Nelson, D. R., Berkes, F., Eakin, H., Folke, C., Galvin, K., Gunderson, L., Goulden, M., O'Brien, K., Ruitenbeek, J., Tompkins, E.L. (2011). Resilience implications of policy responses to climate change. *ClimateChange* **2:** 757–766. doi:10.1002/wcc.133

Adger, W. N., Kelly, P. M. (1999). Social vulnerability to climate change and the architecture of entitlements. *Mitigation Adaptation Strategies for Global Change* **4**: 253-256.

African Union., United Nations International Strategy for Disaster Reduction and The World Bank. (2008). *Status of Disaster Risk Reduction in the Sub-Saharan Africa Region*. Washington, D.C: World Bank.

Alinovi, L., D'Errico, M., Mane, E and Romano, D. (2010). Livelihood Strategies and Household Resilience to Food Insecurity: An Empirical Analysis to Kenya. Rome: FAO.

Alinovi, L., Mane, E. and Romano, D. (2009). Measuring Household Resilience to Food Insecurity: Application to Palestinian Households. *Working Paper*. Rome: FAO.

Alinovi, L., D'Errico, M., Mane, E. and Romano, D. (2011) Livelihoods Strategies and Household Resilience to Food Insecurity: An Empirical Analysis to Kenya. *Background Paper to European Report on Development 2010*. Florence: European University Institute.

Allenby, B. and Fink, J. (2005). Toward inherently secure and resilient societies. *Science* (New York, N.Y.), **309** (5737), 1034–6. doi:10.1126/science.1111534

Antonovsky, A. and Bernstein, J. (1986). Pathogenesis and salutogenesis in war and other crises: Who studies the successful coper? In: VanBreda, A.D-P. (2001) Resilience Theory: A Literature Review with special chapters on deployment resilience in military families & resilience theory in social work. Retrieved from: http://www.vanbreda.org/adrian/resilience/resilience9.pdf

Badjeck, M-C, Allison, E.H., Halls, A.S., Dulvy, N. (2009). Impacts of climate variability and change on fishery-based livelihoods. *Marine Policy* (2009):1-9. doi:10.1016/j.marpol.2009.08.007.

Benson, C. (1998). Drought and the Zimbabwe Economy, 1980-93. In: O' Neill, H. and Toye, J. (eds). (1998). *A World without Famine: New Approaches to Aid and Development*. Hampshire: Macmillan Press Ltd.

Bennett, E.M., G.S. Cumming, G.D. Peterson. (2005). A Systems Model Approach to Determining Resilience Surrogates for Case Studies. *Ecosystems* **8**:945-957.

Berkhout, F., Hertin, J., and Gann, D. M. (2006). Learning to Adapt: Organisational Adaptation to Climate Change Impacts. *Climatic Change*, **78** (1), 135–156. doi:10.1007/s10584-006-9089-3

Bourdieu, P. (1986). Forms of Capital. In Richardson, J.G (ed.), *Handbook of Theory and Research for the Sociology of Education*. New York: Greenwood.

Brand, F. S., and Jax, K. (2007). Focusing the Meaning (s) of Resilience: Resilience as a Descriptive Concept and a Boundary Object. *Ecology and Society*, **12**(1).

Bryman, A. (1992).Quantitative and Qualitative Research. Further reflections on their integration. In: Seale, C. (ed). 2004. *Social Research Methods: A Reader*. London: Routledge.

Bunce, M., Brown, K., and Rosendo, S. (2010). Policy misfits , climate change and cross-scale vulnerability in coastal Africa : how development projects undermine resilience. *Environmental Science & Policy*, **13**, 485–497. doi:10.1016/j.envsci.2010.06.003

Burke, E. J., Brown, S.J. and Christidis, N. (2006). Modeling the Recent Evolution of Global Drought and Projections for the Twenty-First Century with the Hadley Centre Climate Model. *J. Hydrometeor* **7:** 1113–1125doi:http://dx.doi.org/10.1175/JHM544.1

Burton, I., van Aalst, M. (2004). Look before you leap: A risk management approach for incorporatingclimate change adaptation in World Bank operations. *Draft Prepared for the Climate change Team (ENV)*. Washington: World Bank. Accessed from:

http://www.wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2004/10/06/000160016_20041006165241/Rendered/PDF/300650PAPER0Look0Before0You0Leap.pdf on 10 May 2010

Cabell, J. F. and Oelofse, M. (2012). An indicator framework for assessing agro-ecosystem resilience. *Ecology and Society* **17**(1): 18. Retrieved from: http://dx.doi.org/10.5751/ES-04666-170118.

Carpenter, S., Walker, B., Anderies, J.M., Abel,N. (2001).From metaphor to measurement: resilience of what to what? *Ecosystems* 2001, **4**: 765–781.

Carr, E. R. (2005). Placing the environment in migration: environment, economy, and power in Ghana's Central Region. *Environment and Planning A* 37(5): 925-946.

Carraro, C., De Cian, E., and Tavon, M. (2012). Human capital, innovation and climate policy: An integrated assessment. *Climate Change and Sustainable Development Series*. Venice: Fondazione Eni Enrico Mattei. Retrieved from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2034137

CEDAW. (2008). *Report of the Committee on the Elimination of Discrimination. against Women*. 42nd Session. New York: United Nations Committee on the Elimination of Discrimination against Women. Retrieved from: http://www2.ohchr.org/english/bodies/cedaw/cedaws42.htm

Christensen, I. and Pozarny, P. (2008). Socio-economic and Livelihoods Analysis in Investment Planning: Key Principles and Methods. Applied Material. *EASYPol Module 201*. Rome: Food and Agriculture Organisation. Retrieved from: http://www.fao.org/docs/up/easypol/581/37_socioeconomic_livelihoods_analysis_201en.pdf

Christensen, J. H., B. Hewitson, A. Busuioc, A. Chen, X. Gao, I. Held, R. Jones, R. K. Kolli, W.-T. Kwon, R. Laprise, V. Magaña Rueda, L. Mearns, C. G. Menéndez, J. Räisänen, A. Rinke, A. Sarr, and P. Whetton. (2007) *Regional Climate Projections*. In Climate Change 2007: The Physical Science Basis - Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, eds. S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor and H. L. Miller, 847-940. Cambridge, UK: Cambridge University Press.

Clay, E. (1995). Aid and Drought: Responding to the Human and Economic Consequences of Natural Disasters. In: O' Neill, H. and Toye, J. (eds). (1998). *A World without Famine: New Approaches to Aid and Development.* Hampshire: Macmillan Press Ltd.

Clay, E. (1998). Aid and Drought: Responding to the Human and Economic Consequences of Natural Disasters. In: O' Neill, H. and Toye, J. (eds). (1998). *A World without Famine: New Approaches to Aid and Development*. Hampshire: Macmillan Press Ltd.

Cleaver, F. (2005). The inequality of social capital and the reproduction of chronic poverty. *World Development*, **33** (6): 893-906. doi: 10.1016/j.worlddev.2004.09.15

Coates, J., Frongillo, E. A., Rogers, L., Webb, P., Wilde, P. E., and Houser, R. (2006). Advances in Developing Country Food Insecurity Measurement Commonalities in the Experience of Household Food Insecurity across Cultures : What Are Measures Missing ? *The Journal of Nutrition*, 1438–1448.

Colten,C. E., Kates, R. W. and. Laska, S. B. (2008). Community Resilience: Lessons from New Orleans and Hurricane Katrina. *Community and Regional Resilience Initiative (CARRI) Report 3.* Oak Ridge: CARRI

Cumming, D. H. M. (1999). Living off "biodiversity": whose land, whose resources and where? Environment. In: Walker, B., Holling, C.S., Carpenter, S.R., Kinzig, A. (2004) Resilience, adaptability and transformability in social-ecological systems. *Ecology and Society* **9** (2). Retrieved from: http://www.ecologyandsociety.org/vol9/iss2/art5/ on 10 June 2010.

Cutter, S.L., Barnes, L., Berry, M., Burton, C., Evans, E., Tate, E., Webb, J. (2008). A place-based model for understanding community resilience to disasters. *Global Environmental Change* **18** (2008) 598-606. DOI: 10.1016/j.gloenvcha.2008.07.013

Creswell, J W. (1994). *Research Design: Qualitative and Quantitative Approaches*. Thousand Oaks, CA: Sage.

Dai, A. (2011). Drought under global warming : *Climate Change* **2** (Advanced Review), 45–65. doi:10.1002/wcc.81.

Dasgupta, P. (1988). Trust as a commodity. In: Cleaver, F. (2005). The inequality of social capital and the reproduction of chronic poverty. World Development, 33 (6): 893-906. doi: 10.1016/j.worlddev.2004.09.15

Daskon, C.D. (2010). Cultural resilience-the role of cultural traditions in sustaining rural livelihoods: a case study from rural villages in Central Sri Lanka. *Sustainability* **2010**, *2*, 1080-1100; doi:10.3390/su2041080

Denzin, N. and Lincoln, Y. (Eds). (1994). *Handbook of qualitative research*. Thousand Oaks: Sage

Deshmukh, A. and Hastak, M. (2009). A Framework for Enhancing Resilience of Community by Expediting Post Disaster Recovery. *Top Papers*, Purdue University . 362–370.

Devereaux, S., Tiba, Z. (2007).Malawi's first famine, 2001–2002, Chapter 7. In Devereaux, S. 2009. Why does famine persist in Africa? *Food Security* **1**: 25-35. doi:10.1007/s12571-008-0005-8

Devereaux, S. (2009). Why does famine persist in Africa? *Food Security* **1**: 25-35. doi:10.1007/s12571-008-0005-8

DFID (2011) *Defining Resilience: A DFID Approach*. London: Department for International Development, UK. Retrieved from: http://www.dfid.gov.uk/Documents/publications1/Defining-Disaster-Resilience-DFID-Approach-Paper.pdf

DFID. (1999). Sustainable Livelihoods Guidance Sheets, Numbers 1–8, London: Department for International Development (also available on www.livelihoods.org)

Di Falco, S., and J. P. Chavas. (2008). Rainfall shocks, resilience, and the effects of crop biodiversity on agro-ecosystem productivity. In: Cabell, J. F. and Oelofse, M. (2012). An indicator framework for assessing agroecosystem resilience. *Ecology and Society* **17**(1): 18. Retrieved from: http://dx.doi.org/10.5751/ES-04666-170118.

Dovers, S. R., Handmer, J.W. (1992). Uncertainty, sustainability and change. *Global Environmental Change* **2** (4): 262-276.

Downing, T and Franklin, S. (2004). Choosing methods in assessments of vulnerable food systems. Poverty and Vulnerability Programme. *GECAFS Project.* Stockholm Environment Institute. Retrieved from: http://www.gecafs.org/publications/Publications/GECAFS_methodology.PDF on 19 September 2010

Drimie, S., Arntzen, J., Ingram, J. S. I., Mano, R. T., Dube, P., Mataya, C., M. T. Muchero, M.T., 7, E. Vhurumuku, E., and Ziervogel, G**. (2011).** Global environmental change and food systems in Southern Africa: The dynamic challenges facing regional policy. *Journal of Geography and Regional Planning* **4**(4):169-182.

Durodié,B. and Wessely, S. (2002). Resilience or panic? The public and terrorist attack. *The Lancet* **360**. December 14, 2002.

EAD (2002). National Environmental Action Plan. Ministry of Mines, Natural Resources and Environment. Lilongwe: Environmental Affairs Department.

EAD (2004). *Malawi National Strategy for Sustainable Development.* Lilongwe: Environmental Affairs Department.

Eakin, H., and Luers, A. L. (2006). Assessing the Vulnerability of Social-Environmental Systems. *Annual Review of Environment and Resources*, **31(**1), 365–394. doi:10.1146/annurev.energy.30.050504.144352

Easterling, W.E., Aggarwal, P.K., Batima, P., Brander, K.M., Erda, L., Howden, S.M., Kirilenko, A., Morton, J., Soussana, J.-F., Schmidhuber, J. and Tubiello, F.N. (2007). Food, fibre and forest products. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution ofWorking Group II to the Fourth*

Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge, UK: Cambridge University Press, 273-313.

Edwards, F. L. (2010). Recovery or Resilience Along the Post-Katrina Gulf Coast? *The Public Manager*, Fall 2010 (August).

Elbadawi, I. (1998). Structural adjustments and drought in Sub-Saharan Africa. In :O' Neill, H. and Toye, J. (eds). (1998). *A World without Famine: New Approaches to Aid and Development*. Hampshire: Macmillan Press Ltd.

Ellis, F. (2000). *Rural Livelihoods and Diversity in Developing Countries*. Oxford: Oxford University Press.

Ericksen, P.J. 2008. Conceptualising food systems for global environmental change research. *Global Environmental Change* **18** (2008):234-245. doi:10.1016/j.gloenvcha.2007.09.002

Ericksen, P.J. 2008. What is the vulnerability of a food system to global environmental change? *Ecology and Society* **13** (2):14

Ericksen, P., Bohle, H-S. and Stewart, B. (2010). Chapter 5: Vulnerability and Resilience of Food Systems. In: Ingram, J., Ericksen, P. and Liverman, D. (eds.) (2010). *Food Security and Global Environmental Change.* London: Earthscan

Escobar, J. C., Lora, E. S., Venturini, O.J., Yanez, E.E., Castillo, E.F. and Almazan, O. (2009). Biofuels: environment, technology and food security. *Renewable and Sustainable Energy Reviews* **13**, 1275-1287 (2009) doi: 10.1016/j.rser.2008.08.014.

FAO (1996). Report of the World Food Summit, 13–17 November 1996, *Part I, WFS96/REP*. Rome: Food and Agriculture Organisation of the United Nations. Retrieved from: http://www.fao.org/docrep/003/w3548e/w3548e00.htm

FAO (2005). Malawi facing serious food crisis. FAO Newsroom. Rome: Food and Agriculture Organisation of the United Nations. Retrieved from: http://www.fao.org/newsroom/en/news/2005/107298/index.html

FAO (2011). The State of Food Insecurity in the World: How does international price volatility affect domestic economies and food security? Rome: Food and Agriculture Organisation of the United Nations. http://www.fao.org/docrep/014/i2330e/i2330e.pdf

Falkenmark, M., and Rockström, J. (2008). Building resilience to drought in desertification-prone savannas in Sub-Saharan Africa: The water perspective. *Natural Resources Forum* **32**(2), 93–102. doi:10.1111/j.1477-8947.2008.00177.x

Fazey, I., Gamarra, J.G.P., Fischer, J., Reed, M.S., Stringer, L.C. and Christie, M. (2010). Adaptation strategies for reducing vulnerability to future environmental change. *Frontiers in Ecology and the Environment* **8**: 414–422. Retrieved from: http://dx.doi.org/10.1890/080215

Fenton, M., Kelly, G., Vella K and Innes, J. (2007) Climate change and the Great Barrier Reef: industries and communities. In: Maguire, B. and Cartwright, S. (2008). Assessing a community's capacity to manage change: A resilience approach to social assessment. Canberra: Commonwealth of Australia 2008.

Folke, C. (2006). Resilience: The emergence of a perspective for social – ecological systems analyses. *Global Environmental Change* **16**: 253–267. doi:10.1016/j.gloenvcha.2006.04.002

Foresight. (2011). The Future of Food and Farming. *Final Project Report.* London: The Government Office for Science.

Fukuyama, F. (1999). *The Great Disruption*. New York: Simon and Schuster

Gaillard, D. (2010). Vulnerability, capacity and resilience: Perspectives for climate and development policy. *Journal of International Development* **22**(2010): 218-232.

Gaillard, J.C. (2007). Resilience of traditional societies in facing natural hazards. *Disaster Prevention and Management***16**(4): 522-544.

Gallopin, G.C. (2006). Linkages between vulnerability, resilience, and adaptive capacity. *Global Environmental Change* **16** (2006):293-303.

Garmezy, N. (1971). Vulnerability research and the issue of primary prevention. In: Luthar, S.S., Cicchetti, D. and Becker, B. (2000). The construct of resilience: a critical evaluation and guidelines for future work. *Child Development*, 2000 **71** (3): 543-562

Garmezy, N. (1994). Reflections and commentary on risk, resilience and development. In: Saleebey, D. (1996). The strengths perspective in social work practice: Extensions and cautions. *Social Work* **41**, 295-305.

GECAFS (2005). Science Plan and Implementation Strategy. *GECAFS Report 1.* Wallingford, UK: GECAFS

Gibbs, G. (2007). *Analyzing qualitative data*. London: Sage Publications.

Giddens, A. (1984). *The Constitution of Society. Outline of the Theory of Stracturation.* Cambridge: Polity

Gillespie, H. and Gillespie G. W. Jr. (2000). Community Food Systems: towards a common language for building productive partnerships. Cornell Community Nutrition Program, Division of Nutritional Sciences, Cornell University. Retrieved from: www.ccc.cornell/programs/foodsystems

Glantz, M.H. (ed). (1987). *Drought and hunger in Africa: denying famine a future*. Cambridge: Cambridge University Press.

Godfray, C.H., Beddington, J.R., Crute, I.R., Haddad, L., Lawrence, D.,. Muir, J.F., Pretty, J., Robinson, S., Thomas, S.M., Toulmin, C. (2010). Food Security: The Challenge of Feeding 9 Billion People. *Science* **327** (812 (2010)). doi:10.1126/science.1185383.

GOM, 2002. Malawi's Initial National Communication (INC). Lilongwe, Malawi:

GOM, 2006. Malawi's National Adaptation Programme of Action (NAPA)., Lilongwe, Malawi: Environmental Affairs Department.

GOM, 2009. Programmes Containing Measures to Facilitate Adequate Adaptation to Climate Change. Chapter 4 in: *Second National Communication on Malawi*. Ministry of Lands and Natural Resources, Department of Environmental Affairs, Lilongwe, Malawi (pp. 99–172).

Graham, E. (1995). Postmodernism and the possibility of a new human geography. In: Philip, L.J. (1998). Combining quantitative and qualitative approaches to social research in human geography—an impossible mixture? *Environment and Planning A* **30**(2) 261 – 276. doi: 10.1068/a300261

Gregory, P.J., Ingram, J.S.I., Brklacich,M. 2005. Climate change and food security. *Philosophical Transactions of the Royal Society* ***B*** **360**: 2139-2148. doi:10.1098/rstb.2005.1745

Griffith, R., Redding S. and van Reenen, J. (2004). Mapping the interfaces of R &D: Productivity growth-pollution in three prototype growth models. In: Carraro, C., De Cian, E., and Tavon, M. (2012). Human capital, innovation and climate policy: An integrated assessment. *Climate Change and Sustainable Development Series*. Venice:
Fondazione Eni Enrico Mattei. Retrieved from:
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2034137

Grothmann,T. and Patt, A. (2005). Adaptive capacity and human cognition: The process of individual adaptation to climate change. *Global Environmental Change* **15**

Grothmann,T. and Patt, A. (2003). Adaptive Capacity and Human Cognition. Prepared for presentation at the Open Meeting of the Global Environmental Change Research Community, Montreal, Canada, 16-18 October, 2003. Retrieved from:
http://sedac.ciesin.columbia.edu/openmtg/docs/grothmann.pdf

Gunderson, L. (1999). Resilience, Flexibility and Adaptive Management- Antidotes for Spurious Certitude? *Ecology and Society* **3** (1) : 7. Retrieved from: http://www.conecol.org/vol3/iss1/art/

Gunderson, L. H. (2000). Ecological resilience-in theory and application. *Annual Review of Ecology and Systematics* **31**(November 2000): 425-439.

Gunderson, L., and Holling, C.S. (Eds.). (2002). *Panarchy: Understanding transformations in human and natural systems.* Washington, DC: Island Press.

Gwimbi, P. (2009). Linking rural community livelihoods to resilience building in flood risk reduction in Zimbabwe. *Journal of Disaster Risk Studies* **2** (1) March 2009:71-79.

Hammersley, M. (1992). *What's wrong with Ethnography?* London: Routledge

Hammill, A., Matthew, R., McCarter, E. (2008). Microfinance and Climate Change Adaptation. *IDS Bulletin* **39**(4) Institute of Development Studies.

Holling, C. S. (2001). Understanding the complexity of economic, ecological, and social systems. *Ecosystems* **4**:390-405.

Holling, C. S. (1973). Resilience and Stability of Ecological Systems. *Annual Review of Ecology and Systematics* **4** (November 1973): 1-23.

Holling, C. S. (1996. Engineering resilience versus ecological resilience. In: Schulze, P. C (Ed.) (1996) *Engineering within ecological constraints*. Washington, D.C:National Academy Press

Holling, C.S., L.H. Gunderson, and G.D. Peterson. 2002. Sustainability and Panarchies. In**:** *Panarchy: Understanding transformations in Human and Natural Systems*. Gunderson, L.H. and Holling, C.S. (Eds.).Island Press. Washington D.C.

Hosseini, S.M., Sharifzadeh, A. and Akbari, M. (2009). Causes, Effects and Management Mechanisms of Drought Crisis in Rural and Nomadic Communities in South-eastern Iran as Perceived by Agricultural/Rural Managers and Specialist. *Journal ofHuman Ecology* **27**(3): 189-200.

Howden, S.M., Soussana, J-F., Tubiello, F.N., Chhetri, N., Dunlop, M. and Meinke, H. (2007). Adapting agriculture to climate change. *Proceedings of the National Academy of Sciences of the United States of America (PNAS).***104** (50): 19691–19696. doi: 10.1073/pnas.0701890104

Ingram, J.S. I. (2011). A food systems approach to researching food security and its interactions with global environmental change. *Food Security* **3** (4): 417-431. DOI: 10.1007/s12571-011-0149-9

IPCC. 2001. Climate Change (2001). Impacts, Adaptation, and Vulnerability. *Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change*.Cambridge University Press, Cambridge UK. Retrieved from: URL:http://www.grida.no/climate/ipcc_tar/wg1/index.htm.

IPCC. (2007). Impacts, adaptations, and vulnerability. *Fourth Assessment Report*. Cambridge UK: Cambridge University Press. Retrieved from: URL: http://www1.ipcc.ch/ipccreports/assessments-reports.htm. Accessed on 29 October, 2009.

IRIN. (2011). Horn of Africa: Fast facts about the East Africa drought. Nairobi. 5 August 2011. Retrieved from: http://www.irinnews.org/Report/93426/HORN-OF-AFRICA-Fast-facts-about-the-drought

Jones, P. and Thornton, P. (2008). Croppers to livestock keepers: livelihood transitions to 2050 in Africa due to climate change. *Environmental Science and Policy* **12**: 427-437.

Kaplan, C. P., Turner, S., Norman, E., and Stillson, K. (1996). Promoting resilience strategies: A modified consultation model. *Social Work in Education* **18:** 158-168.

Kasperson, J.X., Kasperson, R.E., Turner, I.L., Schiller, A. and Hsiel, W.H. (2005). Vulnerability to global environmental change. In: Gallopin, G.C. (2006). Linkages between vulnerability, resilience, and adaptive capacity. *Global Environmental Change* **16** (2006):293-303.

Keil, A., Zeller, M., Wida, A., Sanim, B. and Birner, R. (2008)What determines farmers' resilience towards ENSO relateddrought? An empirical assessment in Central Sulawesi, Indonesia. *Climatic Change* (2008) **86**:291–307. DOI 10.1007/s10584-007-9326-4

Kitzinger, J. (1994). The methodology of focus groups: the importance of interactions between research participants. In: Bryman, A and Burgess, RG. 1994. *Analysing Qualitative Data*. London: Routledge

Klein, R. J. T., Nicholls, R. J., and Thomalla, F. (2003). Resilience to natural hazards: How useful is this concept? *Environmental Hazards* **5** (2003), 35–45. doi:10.1016/j.hazards.2004.02.001

Lambin, E.F. (2005). Conditions for sustainability of human-environment systems: information, motivation, and capacity. In: Folke, C. (2006). Resilience: The emergence of a perspective for social – ecological systems analyses. *Global Environmental Change* **16** 253–267. doi:10.1016/j.gloenvcha.2006.04.002

Lin, B. B. (2011). Resilience in Agriculture through Crop Diversification : Adaptive Management for Environmental Change. *BioScience*, **61**(3), 183–193. doi:10.1525/bio.2011.61.3.4

Lindell, M.K. (2010). Built-in resilience. *Nature Geoscience* **3** (11) 737-740. doi:10.1038/ngeo99

Luthar, S.S., Cicchetti, D. and Becker, B. (2000). The construct of resilience: a critical evaluation and guidelines for future work. *Child Development*, 2000. 71 (3): 543-562

Manyena, S. B. (2006). The concept of resilience revisited. *Disasters*, ***30***(4), 433–50. doi:10.1111/j.0361-3666.2006.00331.x

Marshall, N.A. (2010). Understanding social resilience to climate variability in primary enterprises and industries. *Global Environmental Change* **20** (2010):36-43. DOI: 10.1016/j.gloenvcha.2009.10.003

Marshall, N. A., Marshall, P.A. (2007). Conceptualizing and operationalizing social resilience within commercial fisheries in northern Australia. *Ecology and Society* **12**(1): 1.

Marshall, N. A., Fenton, D. M., Marshall, P. A and Sutton, S. G. (2007) How resource dependency can influence social resilience within a primary resource industry. *Rural Sociology* **72**: 359-90.

Maxwell, D., Caldwell, R., Langworthy, M.(2008). Measuring food insecurity: Can an indicator based on localized coping behaviours be used to compare across contexts? *Food Policy* **33** (2008) 533-540. doi:10.1016/j.foodpol.2008.02.004.

Maxwell, D., Ahiadeke, C., Levin, C Armar-Klemesu, M., Zakariah,S., and Lamptey, G.M. (1999). Alternative Food-Security Indicators:Revisiting the Frequency and Severity of "Coping Strategies."*FoodPolicy* **24** (1999): 411–429.

McKay, G. A., Godwin, R. B. and Maybank, J. (1989). Drought and Hydrological Drought Research in Canada: An Evaluation of the State of the Art. *Canadian Water Resource Journal* **14**:71-84.

McLafferty, S.L. (1995). Counting for women. In: Philip, LJ. 1998. Combining quantitative and qualitative approaches to social research in human geography—an impossible mixture? *Environment and Planning A* **30**(2) 261 – 276. Doi: 10.1068/a300261

McSweeney, C., New, M. and Lizcano, G. (2008). *UNDP Climate Change Country Profiles: Malawi*. Retrieved from: http://www.geog.ox.ac.uk/research/climate/projects/undpcp/UNDP_reports/Malawi/Malawi.lowres.report.pdf

Meat Trade News. Malawi-Swine fever takes 100,000 pigs. 18th June, 2011. Retrieved from: http://meattradenewsdaily.co.uk/news/160611/malawi___swine_fever_takes__pigs_.aspx

Miles, M.B. and Huberman, A.M. (1994).*Qualitative Data Analysis*. 2nd Edition. In: Punch, K.F. (2005). *Introduction to Social Research: Quantitative and Qualitative Approaches*. 2nd Edition. London: Sage

Millennium Ecosystem Assessment. (2005). Ecosystems and Human Well-being: Biodiversity Synthesis. Washington, DC: World Resources Institute. Retrieved from: http://www.millenniumassessment.org/en/Synthesis.aspx. Accessed on 4 November, 2009

MMS. 2006. *Climate of Malawi*. Department of Climate Change and Meteorological Services. Lilongwe, Malawi. Retrieved on 26th February, 2010 from: http://www.metmalawi.com/climate/climate.php

Mogadas-Farimani, S. and Hossaini, S.M. (2004). Pasture ecosystem management in drought. *Proceeding ofAgricultural Science in Arid Area.* Ardestan Azad University Press, Iran.

Morgan, D.L. (1988). Focus Groups as Qualitative Research. In: Punch, KF. 2005. *Introduction to Social Research: Quantitative and Qualitative Approaches*. 2nd Edition.London: Sage.

Moser, C.O.N. 1998. The Asset Vulnerability Framework: Reassessing Urban Poverty Reduction Strategies', *World Development* **26**.1: 1–19.

Mullings, B. (1999). Insider or outsider, both or neither: some dilemmas of interviewing in cross cultural setting. *Geoforum* **30** (1999).337-350.

Murphy, E. and Dingwall, R. (2003). *Qualitative Methods and Health Policy Research*. New York: Aldine de Gruyter.

Narayan, D. (1997). Voices of the poor: poverty and social capital in Tanzania. *Environmentally and Socially Sustainable Development Studies and Monograph Series 20.* Washington, D.C: World Bank.

Naylor, R.L., Liska, A.J., Burke, M.B., Falcon, W.P., Gaskell, S.D., Cassman, K.G. (2007). The Ripple Effect: Biofuels, Food Security, and the Environment. *Environment: Science and Policy for Sustainable Development* **49** (9) 2007. DOI**:**10.3200/ENVT.49.9.30-43.

Nelson, D. R., Adger, W. N., and Brown, K. (2007). Adaptation to Environmental Change: Contributions of a Resilience Framework. *Annual Review of Environment and Resources*, *32*(1), 395–419. doi:10.1146/annurev.energy.32.051807.090348.

Nelson, G.C., Rosegrant, M.W., Koo, J., Robertson, R., Sulser, T., Zhu, T., Ringler, C., Msangi, S., Palazzo, A., Bakta, M., Magalhaes, M., Valmonte-Santos, R., Ewing, M., Lee, D. (2009). *Climate Change: Impacts on agriculture and costs of adaptation.* Washington DC: International Food Policy Research Institute. Retrieved from:

http://www.ifpri.cgiar.org/sites/default/files/publications/pr21.pdf on 6 Dec 2009. Accessed on 6 Dec 2009.

North, D.C. (1994). Economic Performance Through Time. *The American Economic Review* **84**, No. 3.(Jun., 1994), pp. 359-368.

NSO. (2007). Malawi Multiple Indicator Cluster Survey 2006, Final Report. Zomba: National Statistical Office and UNICEF. Retrieved from: http://www.medcol.mw/commhealth/publications/MICS%20Report.pdf

NSO (2009). 2008 Population and Housing Census. Zomba: National Statistical Office of Malawi. Retrieved from: http://www.nsomalawi.mw/images/stories/data_on_line/demography/census_2008/Main%20Report/Census%20Main%20Report.pdf

NZAid. (2007).NZAID Sustainable Livelihoods Approach Guideline. Wellington: NZAid. Retrieved from: http://nzaidtools.nzaid.govt.nz/sites/default/files/sustainable-livelihoods1158069.pdf. Accessed on 9 December, 2009.

O'Brien, Karen and Robin Leichenko. (2000). Double Exposure: Assessing the Impacts of Climate Change within the Context of Economic Globalization. *Global Environmental Change***10**: 221–232.

O'Brien,K., Leichenko, R., Kelkar, U., Venema, H., Aandahl,G., Tompkins, H., Javed, A., Bhadwal, S., Barg, S., Nygaard, L., West,J. 2004. Mapping vulnerability to multiple stressors: climate change and globalisation in India. *Global Environmental Change* **14** (2004) 303-313.

O'Connor, R., Bord, R.J. and Fisher, A. (1999). Risk perceptions, general environmental beliefs, and willingness to address climate change. *Risk Analysis* **19** (3): 461-471. DOI: 10.1023/A:1007004813446.

Olick, J.K., Robbins, J. (1998). Social memory studies: from collective memory to historical sociology of mnemonic practices. *Annual Review of Sociology* **24**:105-140.

Oxfam. (2007). Focus Group Discussions. *Good Enough Guide*. Oxford: Oxfam. Retrieved from: http://www.oxfam.org.uk/resources/downloads/good_enough_guide/good_enough_guide_book_en.pdf.

Paavola, J. (2004) Livelihoods, Vulnerability and Adaptation to Climate Change in the Morogoro Region, Tanzania. *CSERGE Working Paper EDM 04-12.* Norwich: University of East Anglia. Retrieved from: http://www.cserge.ac.uk/sites/default/files/edm_2004_12.pdf

Pauw, K., Thurlow, J., van Seventer, D. E. (2010). Droughts and floods in Malawi: assessing the economy-wide effects. *IFPRI discussion paper 00962*. Washington: International Food Policy Research Institute.

Parry, M. and Carter, T. (1998). Climate Impact and Adaptation Assessment. In: O'Brien, Karen and Robin Leichenko. 2000. Double Exposure: Assessing the Impacts of Climate Change within the Context of Economic Globalization. *Global Environmental Change* **10**: 221–232.

Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and Hanson, C.E. (eds). (2007). *Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007*. Cambridge: Cambridge University Press.

Paton, D., Gregg, C. E., Houghton, B. F., Lachman, R., Lachman, J., Johnston, D.M. and Wongbusarakum, S. (2007). The impact of the 2004 tsunami on coastal Thai communities : assessing adaptive capacity, 106–119. doi:10.1111/j.0361-3666.2007.01029.x

Paton, D. and Johnston, D. (2001). Disasters and communities: vulnerability, resilience and preparedness. *Disaster Prevention and Management* **10** (4), 2001: 270-277

Patt, A., Suarez, P. and Hess, U. (2009). How do small-holder farmers understand insurance, and how much do they want it? Evidence from Africa. *Global Environmental Change* **20** (2010) 153–161. doi:10.1016/j.gloenvcha.2009.10.007

Patton, M.Q. (2002). *Qualitative Research and Evaluation Methods.* In: Mikkelsen, B. (2005) *Methods for Development Work and Research: A new guide for* practitioners. Second Edition. London: Sage Publications.

Payne, G. and Payne, J. (2004) *Key Concepts in Social Research.* London: Sage Publications.

Phiri, M.G.I. and Saka, R.S. (2009). The Impact of Changing Environmental Conditions on Vulnerable Communities in the Shire Valley, Southern Malawi. In: Lee, C and Schaaf, T. (2009). *The Future of Drylands*. Springer Netherlands. DOI: 10.1007/978-1-4020-6970-3_49

Philip, L.J. (1998). Combining quantitative and qualitative approaches to social research in human geography—an impossible mixture? *Environment and Planning A* **30** (2) 261 – 276. doi: 10.1068/a300261

Peterson, G. (2009). Ecological limits of adaptation to climate change. In: Cabell, J. F., and Oelofse, M. 2012. An indicator framework for assessing agro-ecosystem resilience. *Ecology and Society***17**(1): 18. Retrieved from: http://dx.doi.org/10.5751/ES-04666-170118.

Pickett, S. T. A., Cadenasso, M. L. and J. M. Grove. (2004). Resilient cities: meaning, models, and metaphor for integrating the ecological, socio- economic, and planning realms. In: Brand, F. S., and Jax, K. (2007). Focusing the Meaning (s) of Resilience: Resilience as a Descriptive Concept and a Boundary Object. *Ecology and Society*, **12** (1).

Pimm, S. L. (1984). The complexity and stability of ecosystems.*Nature* **307**(26):321–326

Pingali, P. (2004).Westernization of Asian Diets and the transformation of food systems: Implications for research and policy. *ESA Working Paper No. 04-17 September 2004.* Rome: Agricultural and Development Economics Division, The Food and Agriculture Organization of the United Nations. Retrieved from: http://ageconsearch.umn.edu/bitstream/23795/1/wp040017.pdf

Prowse, M. and Scott, L. (2008). Assets and Adaptation: An Emerging Debate. *IDS Bulletin* **39** (4), 42-52.

Punch, K.F. (2005). *Introduction to Social Research: Quantitative and Qualitative Approaches.* 2nd Edition. London: Sage.

Rajkumar, A. P., Premkumar, T. S., and Tharyan, P. (2008). Coping with the Asian tsunami: perspectives from Tamil Nadu, India on the determinants of resilience in the face of adversity. *Social Science & Medicine (1982)* **67** (5), 844–53. doi:10.1016/j.socscimed.2008.05.014

Rasmusson, E.M. (1987). Global climate change and variability: effects on drought and desertification in Africa. In: Glantz, M.H. (ed). (1987). *Drought and hunger in Africa: denying famine a future*. Cambridge: Cambridge University Press.

Reinharz, S. (19920). Feminist Methods in Social Research. In: Punch, K.F. (2005). *Introduction to Social Research: Quantitative and Qualitative Approaches. 2nd Edition.* London: Sage

Repetto, R. and Baliga, S. S. (1996) Pesticides and the immune system: the public health risks. *Central European Journal of Public Health.* 1996 Dec; **4**(4):263-5.

Resilience Alliance (2007) Assessing and managing resilience in social-ecological systems: *A practitioners' workbook (Version 1.0).* www.resalliance.org

Robson, E., Ansell, N., van Blerk, L., Chipeta, L. and Hadju, F. (2007). AIDS and food insecurity: new variant famine in Malawi?' *Malawi Medical Journal* **19**(4) 136-137.

Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *Journal of Psychology* **91:** 93-114.

Rogers, R.W. (1983). Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In: Floyd, D.L., Prentice-Dunn, S. and Rogers, R.W. (2000). *Journal of Applied Social Psychology*, 2000. **30** (2): 407-429.

Rogers, R. W. and Prentice-Dunn, S. (1997) Protection motivation theory. In: Floyd, D. L., Prentice-Dunn, S. and Rogers, R.W. (2000). A Meta-Analysis of Research on Protection Motivation Theory. *Journal of Applied Social Psychology*, **30**: 407–429. doi: 10.1111/j.1559-1816.2000.tb02323.x

Ronan, K. R., Johnston, D.M., Daly, M., Fairley, R. (2001) School children's risk perceptions and preparedness : A hazards education survey. The Australian *Journal of Disaster and Trauma Studies*. **2001** (1).

Rosegrant, M.W., Cline, S.A., Li, W., Sulser, T, B.andValmonte-Santos, R.A. (2005). Long-Term Prospects for Africa's Agricultural Development and Food Security.*2020 Discussion Paper No. 41*. Washington, D.C.: International Food Policy Research Institute.

Rosegrant M.W., Cai, X., Cline S.A.(2002). The role of rain-fed agriculture in the future of global food production. *EPTD Discussion Paper No.90.* Environment and Production Technology Division, Washington, D.C: International Food Policy Research Institute. Retrieved from: http://ageconsearch.umn.edu/bitstream/16053/1/ep020090.pdf

Rubin, O. (2009). The Niger famine: a collapse of entitlements and democratic responsiveness. In Devereaux, S.(2009). Why does famine persist in Africa? *Food Security* **1**: 25-35. doi:10.1007/s12571-008-0005-8

Rule, S. (1988). 600,000 Mozambique Refugees Tax an Already Desperate Malawi. *Special to the New York Times*, July 18, 1988. Retrieved from: http://www.nytimes.com/1988/07/18/world/600000-mozambique-refugees-tax-an-already-desperate-malawi.html

Salama P., Assefa, F., Talley, L., Spiegel, P., van der Veen, A., Gotway, C. (2001). Malnutrition, measles, mortality, and the humanitarian response during a famine in Ethiopia. *JAMA***286** (5):563–571.

Scrimshaw, N.S. (1987).The Phenomenon of Famine. *Annual Review of Nutrition* **7**: 1-22. DOI: 10.1146/annurev.nu.07.070187.000245

Slovic, P., Kunreuther, H., and White, G. F. (2000). Decision processes, rationality and adjustment to natural hazards. In: McLeman, R. (2010). Impacts of population change on vulnerability and the capacity to adapt to climate change and variability: a typology based on lessons from a "hard country". *Population and Environment* 2010 (**31**): 286-316.

Stern, N. (2007).*The Economic of Climate Change: The Stern Review*. Cambridge UK: Cambridge University Press

Strunz, S. (2012). Is conceptual vagueness an asset? Arguments from philosophy of science applied to the concept of resilience. *Ecological Economics* **76** (2012)112-118.

Tierney, K., Bruneau, M. (2007) Conceptualising and measuring resilience: a key to disaster loss reduction. *TR News* May-June, 14-17

Timmerman, P. (1981). Vulnerability, Resilience and the Collapse of Society. *Environmental Monograph* **1**. Institute for Environmental Studies,Toronto University.

Tschirley, D. L. and Jayne, T. S. (2010). Exploring the Logic Behind Southern Africa's Food Crises. *World Development* **38**(1): 76–87. doi:10.1016/j.worlddev.2009.09.008.

Turner, N. J., R. Gregory, C. Brooks, L. Failing, and T. Satterfield. (2008). From invisibility to transparency: identifying the implications. *Ecology and Society* **13**(2): 7. Retrieved from: http://www.ecologyandsociety.org/vol13/iss2/art7/

Turner, B.L., Kasperson, R.E., Matson, P.A., McCarthy, J.J., Corell, R.W., Christensen, L., Eckley, N., Kasperson, J.X., Luers, A., Martello, M.L., Polsky, C., Pulsipher, A. and Schiller, A., 2003. A framework for vulnerability analysis in sustainability science. *Proceedings of the National Academy of Sciences* **100** (14), 8074–8079.

Twigg, J. (2007). *Characteristics of a Disaster-resilient Community: A Guidance Note*. Version 1 (for field testing). August 2007. Retrieved from: https://practicalaction.org/docs/ia1/community-characteristics-en-lowres.pdf

Twigg, J. (2009). *Characteristics of a disaster resilient community: A Guidance Note. Version 2*. November 2009. London: Interagency Group (ActionAid, Christian Aid, Plan UK, Practical Action, Tearfund, British Red Cross/International Federation of Red Cross and Red Crescent Societies. Retrieved from: http://community.eldis.org/.59e907ee/Characteristics2EDITION.pdf

Twomlow, S., Mugabe, F.T., Mwale, M., Delve, R., Nanja, D., Carberry, P., and Howden, M. (2008). Building capacity to cope with increasing vulnerability due to climate change in Africa-A new approach.*Physics and Chemistry of the Earth* **33** (2008):780-787. doi:10.1016/j.pce.2008.06.048.

Twomlow, S.J., Steyn, J.T., du Preez, C.C. 2006.Dryland farming in southern Africa. In Twomlow, S., Mugabe, F.T., Mwale, M., Delve.R.,Namja, D, Carberry, P., Howden, M. (2008). Building adaptive capacity to cope with increasing vulnerability due to climate change in Africa- A new approach. *Physics and Chemistry of the Earth* **33** (2008) 780-787 doi: 10.1016/j.pce.2008.06.048

UN. (2008). *Trends in sustainable development. Agriculture, rural development, land, desertification and drought*. New York: Department of Economic and Social Affairs. United Nations.

UNDP (2011) Human Development Report 2011. Sustainability and Equity: A Better Future for All. New York: United Nations Development Programme. Retrieved from: http://www.undp.org/content/dam/undp/library/corporate/HDR/2011%20Global%20HDR/English/HDR_2011_EN_Complete.pdf

UNDP (2012) Chapter Seven, Empowerment for Social Justice, Gender Equality and Food for Everyone. *Africa Human Development Report 2012: Towards a Food Secure Future*. New York: United Nations Development Programme. Retrieved from: http://www.afhdr.org/AfHDR/documents/chapter7.pdf

Ungar, M. (2006). Resilience across cultures. *British Journal of Social Work (2006)* **1** of 18. doi:10.1093/bjsw/bcl343.

UNISDR (United Nations International Strategy for Disaster Risk Reduction) (2005) *Hyogo Framework for 2005–2015: Building the Resilience of Nations and Communities to Disasters*. Retrieved from: http://www.unisdr.org/wcdr/intergover/official-doc/L-docs/Hyogo-framework-for-actionenglish.pdf. Accessed on 21 June 2010.

Vogel, H. (1994). Weeds in single-crop conservation farming in Zimbabwe.*Soil and Tillage Research* **31** (2-3, August 1994):169-185. doi:10.1016/01671987(94)900787

Walker, J. and M. Cooper. (2011). Genealogies of resilience: From systems ecology to the political economy of crisis adaptation. *Security Dialogue*. **42**(2): 143-160.

Walker, B., Holling, C.S., Carpenter, S.R., Kinzig, A. (2004) Resilience, adaptability and transformability in social-ecological systems. *Ecology and Society***9** (2). Retrieved from: http://www.ecologyandsociety.org/vol9/iss2/art5/ on 10 June 2010.

Walsh, F. (1998). *Strengthening family resilience*. New York: Guilford Press.

Watts, M.J. and Bohle, H.G. (1993). The Space of Vulnerability: the causal structure of hunger and famine. *Progress in Human Geography***17** (1): 43-67.

Webb, P., Coates, J., Frongillo, E.A., Rogers, B.L, Swindale, A. and Bilinsky, P. (2006). Measuring household food insecurity: why it's so important and yet so difficult to do. *Journal of Nutrition* **136**:1404S-1408S.

Werner, E. E., Bierman, J. M. and French, F. E. (1971). *The children of Kauai: A longitudinal study from the prenatal period to age ten. In:* Luthar, S.S., Cicchetti, D. and Becker, B. (2000). The construct of resilience: a critical evaluation and guidelines for future work. *Child Development*, 2000. **71** (3): 543-562.

Wilhite, D.A. (2000). Drought as a Natural Hazard: Concepts and Definitions (Chapter 1, pp. 3-18). In: Hosseini, S.M., Sharifzadeh, A. and Akbari, M. (2009). Causes, Effects and Management Mechanisms of Drought Crisis in Rural and Nomadic Communities in South-eastern Iran as Perceived by Agricultural/Rural Managers and Specialist. *Journal ofHuman Ecology* **27**(3): 189-200.

Wilhite, D.A. and Glantz, M.H. (1985). Understanding the drought phenomenon: The role of definitions. *Water International***10**: 111-120

Wilhite, D.A., Svoboda, M.D. and Hayes, M.J. (2007). Understanding the complex impacts of drought: A key to enhancing drought mitigation and preparedness. *Water Resources Management* (2007) **21**:763–774. DOI 10.1007/s11269-006-9076-5.

Wittgenstein, L. 1953. (2009). *Philosophical Investigations, 4th Edition*. In: Strunz, S. (2012). Is conceptual vagueness an asset? Arguments from philosophy of science applied to the concept of resilience. *Ecological Economics* **76** (2012): 112-118.

Wong, K.F. (2003). Empowerment as a panacea for poverty- old wine in new bottles? Reflections on the World Bank's conception of power. *Progress in Development Studies* October 2003 **3**: 307-322.

World Bank. (2010). World Development Indicators. Washington, DC: World Bank

Yohe, G. (2001). Mitigative capacity: the mirror image of adaptive capacity on the emission side. *Climatic Change* **49**: 247-262

Young, O.R., Berkhout, F., Gallopin, G.C., Janssen, M.A., Ostrom, E., van der Leeuw, S. (2006). The globalisation of socio-ecological systems: an agenda for scientific research. *Global Environmental Change* **16** (2006):304-316. DOI: 10.1016/j.gloenvcha.2006.03.004.

Zamani, G.H., Gorgievski-Duijvesteijn, M.J. and Zarafshani, K. (2006). Coping with drought: Towards a multilevel understanding based on Conservation of Resources theory. *Human Ecology* **34**: 677–692.

Ziervogel, G. (2004). Targeting seasonal climate forecast for integration into household level decisions: the case of smallholder farmers in Lesotho. *The Geographical Journal* **170** (1)

Zimmerer, K.S. (2007). Agriculture, livelihoods, and globalisation: The analysis of new trajectories (and avoidance of just-so stories) of human-environment change and conservation. *Agriculture and Human Values* (2007) **24**:9-16. DOI: 10.1007/s10460.

Annex 1: Common indicators of resilience

Annex 1: Common Indicators of Resilience

Income and Food Access	• Average per person daily income (local currency/person/day) • Average per person daily expenditure (local currency /person/day) • Household food insecurity access score • Dietary diversity and food frequency score • Dietary energy consumption (kcal/person/day)
Access to Basic Services	• Physical access to health services (ordinal, 1 to 3) • Quality score of health services • Quality of educational system (ordinal, 1 to 6) • Perception of security (ordinal, 1 to 4) • Mobility and transport constraints (ordinal, 1 to 3) • Water, electricity and phone networks (count)
Social Safety Nets	• Amount of cash and in-kind assistance (local currency/person/day) • Quality evaluation of assistance (ordinal, 1 to 4) • Job assistance (binary yes/no response) • Frequency of assistance (number of times assistance was received in the last six months) • Overall opinion of targeting (assistance targeted to the needy; to some who are not needy; or without distinction)
Assets	• Housing (number of rooms owned) • Durable index (Principal Component Analysis on list of items: TV, Car, etc...) • Tropical Livestock Unit (TLU) equivalent to 250 KG; • Land owned (in hectares)
Adaptive Capacity	• Diversity of income sources (count, 0 to 6) • Educational level (household average) • Employment ratio (ratio, number of employed divided by household size) • Available coping strategies (count, 0 to 18) • Food consumption ratio (Share of food expenditure divided by total expenditure)
Stability	• Number of household members that have lost their job (count) • Income change (ordinal; increased, the same, decreased) • Expenditure change (ordinal; increased, the same, decreased) • Capacity to maintain stability in the future (ordinal, 1 to 5) • Safety net dependency (share of transfers on the total income) • Education system stability (ordinal; quality increased, the same, decreased)

Annex 2: Household Questionnaire

AN EVALUATION OF SOCIAL AND PHYSICAL RESILIENCE TO DROUGHT IN AGRICULTURAL AND FOOD SYSTEMS IN MALAWI

This survey is being conducted as part of an academic research project by Canford Chiroro of the University of Dundee in Scotland. Participation in this survey is voluntary. Information collected through this process will be held confidentially and will not be disclosed to any third parties.

HOUSEHOLD QUESTIONNAIRE

HOUSEHOLD IDENTIFICATION

District	
EPA	
Traditional Authority	
Village	
Household Name	
Household ID	

Please circle **ONLY ONE** applicable option.

DEMOGRAPHIC CHARACTERISTICS			
A1: Gender of respondent (*Observe and circle*) Male =1 Female=2		A2: What is your relation to the head of household? Head of household=1 Spouse =2 Child=3 Relative =4 Employee=5	
A3: What is the gender of the head of this household? Male=1 Female=2		A4: How old is the head of this household? Below 18years=1 19 to 35years=2 36 to 55 years =3 56 years and above =4	
A5: How old are you? Below 18years=1 19 to 35years=2 36 to 55 years =3 56 years and above =4		A6: What is the marital status of the head of household? Single/Never married=1 Married=2 Married, polygamy=3 Divorced=4 Widowed=5	
A7: In whose village is the household staying? *Prompt for marriage type* Husband (Patriarchal)=1 Wife (Matrilineal)=2		A8: What is the highest level of education that you attained? None=1 Primary school=2 Secondary school=3 Certificate=4 Diploma=5 Degree=6	

A9: What is the highest level of education attained by the household head? None=1 Primary school=2 Secondary school=3 Certificate=4 Diploma=5 Degree=6		A10: How many people normally live in this household? *Count people who have been here in the last three months.* 1-4 members=1 5-9 members=2 10-14 members=3 15 or more members=4	
A11: Are there children of normal school going age who are currently not attending school? Yes=1 No=2**>>A13**		A12: What is the main reason for not attending school? No money for school fees=1 Taking care of sick relative=2 Working within household=3 Working in estates=4 Disability=5 Shortage of food=6 Other (specify)	
A13: What is the household's **MAIN** religion? Christianity=1 Islam (Moslem)=2 African traditional religion=3 None=4 Other =5 Specify.....		A14: What is the **MAIN** language spoken in this household? Chewa 1, Sena 8 Nyanja 2, Nyakyusa 9 Yao 3, Tonga 10 Tumbuka 4, Lambya 11 Lomwe 5, Senga 12 Nkhonde 6, Sukwa 13 Ngoni 7, English 14 Other (specify) 15	
A15: How long have you been living in this area? Less than a year=1 Less than 5 years=2 5 to 10 years=3 11 to 15 years=4 16-20 years=5 More than 20 years=6**>>SECTION B**		A16: If you have lived in this area for less than 20 years, what was your main reason for settling here? Ancestry/marriage/joining family=1 Better soils and access to land=2 Better rainfall=3 Employment /business prospects=4 Other (specify) =5	

B: LIVELIHOOD ACTIVITIES AND ASSETS

B1: By order of importance to you, what livelihood sources are used by this household for cash and in-kind income?

B2: Most important	B3: Second most important	B4: Third most important
Cash crop farming=1	Cash crop farming=1	Cash crop farming=1
Subsistence farming=2	Subsistence farming=2	Subsistence farming=2
Livestock farming=3	Livestock farming=3	Livestock farming=3
Selling firewood=4	Selling firewood=4	Selling firewood=4
Fishing=5	Fishing=5	Fishing=5
Timber=6	Timber=6	Timber=6
Petty trading=7	Petty trading=7	Petty trading=7
Tradesman=8	Tradesman=8	Tradesman=8
Ganyu=9	Ganyu=9	Ganyu=9
Remittances/gifts=10	Remittances/gifts=10	Remittances/gifts=10
Formal employment=11	Formal employment=11	Formal employment=11
Other (specify)=12	Other (specify)=12	Other (specify)=12
.....	.....	.....

B5: Record the **TOTAL** number of livelihood sources available to the household:		B6: How long have you been involved in your **MAIN** livelihood activity?	
		Less than a year=1	
		1-5 years=2	
		6-10 years=3**>>B9**	
		More than 10 years=4**>>B9**	
B7: If you have been using this livelihood source for less than 5 years, what have you always depended on?		B8: If you have not always relied on this livelihood source, what made you change?	
Cash crop farming=1		Loss of regular employment=1	
Subsistence farming=2		End of regular remittances=2	
Livestock farming=3		Death of household head=3	
Selling firewood=4		Experience of drought=4	
Fishing=5		Experience of floods=5	
Timber=6		Theft of property or asset=6	
Petty trading=7		New skills/opportunity available=7	
Tradesman=8		Other=8	
Ganyu=9			
Remittances/gifts=10			
Formal employment=11			
Other (specify)=12			

B9: Considering your **MAIN** livelihood source, what shock could upset your ability to maintain the current or normal income or benefit?		B10: Given your experience in this livelihood activity, are you confident of your ability to deal with and adapt to unfavourable conditions?	
Drought=1 Floods=2 Theft =3 Market shocks=4 Injury or accident=5 Fire=6 Death of household member=7 Other (specify below)=8		Yes=1 No=2	

Ganyu labour in the past twelve months

B11	B12	B13	B14
At any time over the last 12 months, did you do any ganyu labour for anyone who is not a member of your household? Yes=1 No=2**>>B15**	In how many months over the last 12 months did you do ganyu labour?	During those months, approximately how many weeks did you do ganyu?	What was the average daily rate in cash or in kind?
	Number of months	Number of weeks	MK

Which of the following assets do you own? Record working **ONLY**			B24: What asset would you consider as most important to enable your household to survive during a drought period? *Please write the answer below*:	
		Yes=1 No=2		
B15	Bicycle			
B16	Cell phone			
B17	Radio			
B18	Television			
B19	Satellite dish			
B20	Generator			
B21	Car			
B22	Tractor			
B23	Solar panel			

What farm implements, machinery and structures do you own?

		Does your household currently own? Yes=1 No=2		How many ?
	IMPLEMENTS			
B25	Hand hoe		B25b	
B26	Slasher		B26b	
B27	Axe		B27b	
B28	Treadle pump		B28b	
	MACHINERY			
B29	Ox cart		B29b	
B30	Ox plough		B30b	
B31	Tractor		B31b	
	STRUCTURES			
B32	Chicken house		B32b	
B33	Livestock kraal		B33b	
B34	Poultry kraal		B34b	
B35	Granary		B35b	
B36	Pig sty		B36b	

B37: The OUTER walls of the main dwelling used by this household are predominantly made of what material? Grass=1 Mud (yomata)=2 Compacted earth (yamdindo)=3 Mud brick (unfired)=4 Burnt bricks=5 Concrete=6 Wood=7 Iron sheets=8 Other (specify)=9		B38: The roof of the main dwelling is predominantly made of what material? Grass=1 Iron sheets=2 Clay tiles=3 Concrete=4 Plastic sheeting=5 Other (specify)=6	
B39: Have you ever had to reconstruct your dwelling after damage following a flood event or heavy rain? Yes=1 No=2		B40: How far is your house from the nearest road which links you with markets, etc? Less than 500m=1 501m to 3km=2 More than 3km=3	

B41: How far is your house from the nearest source of clean drinking water? Less than 50metres=1 Less than 200m=2 Less than 500m=3 Less than 1 km=4 More than 1km=5		B42: What is your main source of drinking water? Tap/stand pipe=1 Borehole=2 Shallow well with hand pump=3 River=4 Other=5	
B43: Is there a toilet within this homestead? *Also observe and record* Yes=1 No=2		B44: Has any member of the household suffered from malaria in the last 12 months? Yes=1 No=2	
B45: Is there any member of this household who suffered from diarrhoea or cholera in the last 12 months? Yes=1 No=2		B46: Is there a chronically ill member within this household? Yes=1 No=2	
B47: Is your household currently receiving any remittances in cash or kind? Yes=1 No=2**>>B49**		B48: Where is this person based? Rural=1 Urban=2 International=3	
B49: What is the main purpose for which remittances are received? Food consumption=1 Education and health costs=2 Agricultural inputs=3 Investment e.g. buying land=4 Starting a new business=5 Purchasing livestock =6 Other =7		B50: Is there anyone in your household who has received some training in agriculture? Yes=1 No=2	
B51: Does your household generally have adequate labour for farm operations? Yes=1 No =2		B52: Have you required the services of the extension officer in the last twelve months? Yes=1 No=2	
B53: Did you manage to access this service? Yes=1 No=2		B54: How easy is it to access extension advice in your area? Advice very accessible=1 Somewhat difficult=2 Very difficult=3	

Are you a member of any social group? What is the main benefit received? Are you involved in decision making?

	B55	B56	B57
	Yes=1 No=2	Main benefit received Cash income =1 Credit/insurance=2 Food=3 Clothes=4 Psychosocial support=5 Farm labour=6 Agricultural advice=7 Agricultural inputs=8 Sense of responsibility=9 Other=10	Involvement in decision making Yes=1 No=2
Group saving scheme			
Group garden			
Farmers' Association			
Religious group			
Water committee			
Food committee			
Disaster management committee			
Home based care group			
Village development committee			
Other			

B58: In the past 12 months, did you request for credit or loan from any institution or individual? Yes=1 No=2**>>B62**		B59: Was your application/request successful? Yes=1 No=2	
B60: What did you use/intend to use the loan for? Purchasing food and general consumption=1 Purchasing agricultural inputs=2 Purchasing inputs for cash cropping=3 Starting up a small business=4 Medical expenses=5 Transport costs=6 Buying land=7 Other=8		B61: From whom do you normally seek cash loans? Relative or neighbour=1 Informal money lender=2 Employer=5 NGO scheme=6 Commercial bank=7 SACCO=8 MARDEF=9 MRFC=10 Other=11	

B62: Do you have any savings in a bank or savings account? Yes=1 No=2		B63: Do you have insurance? Yes=1 No=2**>>B67**	
B64: What asset have you insured? Livestock (specify) =1 Property=2 Food crops=3 Cash crops=4 Household goods(specify) =5 Motor vehicle=6 Tractor or farm machinery=7		B65: Against what risk have you insured your assets? Drought=1 Floods=2 Fire=3 Theft=4 Mechanical damage=5 Market price=6 Frost=7 Other=8	
B66: Was your decision to get insurance linked to an experience of a shock or related loss? Yes=1 No=2		B67: If you do not have insurance, where are you likely to get resources to enable you to absorb a shock or recover from its impacts? Sell off assets owned=1 Remittances =2 Assistance from NGOs=3 Assistance from government=4 Assistance from friends =5 Other (specify)=6	
C. AGRICULTURAL PRODUCTION			
C1: How much land does your household **OWN**? (1 Hectare=2.5 acres) Irrigation | Dry-land *If household does not own any land**>>C3***		C2: Where did you obtain this land from? Inherited from father's side=1 Inherited from mother's side=2 Given out by local leader=3 Bought through informal market=4 Bought through formal market=5 Other (specify)=6	
C3: How much land did you have access to in the 2009/2010 season? .....acres		C4: Of that land, what proportion did you use for your crops in the 2009/2010 season? Less than 25%=1 25-50%=2 51-75%=3 75-99%=4 100%=5**>>C7** More than 100%=6**>>C7**	

C5: If you used less land than you had access to, what was the **MAIN** reason for that? Had rented out land =1 Inadequate seed or/and fertiliser=2 Lacked adequate labour =3 Lacked draught power/implements=4 Feared another drought=5 Feared another flood=6 Soils too poor, allowing land to recover=7		C6: If inadequate labour (3) was your main reason, what was the cause of lack of adequate labour? Migration of household member =1 Illness within household=2 Disability within the household=3 Lack of cash to hire labour as usual=4 Death of a member of household=5 Marriage of a household member=6 Household members involved in *ganyu*=7	
C7: What is the predominant soil type on your field? Clay=1 Loam=2 Sandy=3		C8: Within this household, who makes most of the decisions on which crops to grow, when to plant, where to plant? *Record gender* Male=1 Female=2 Joint=3	

C9: Which crops did you grow in the previous season, on how much land, how much seed was used and how much did you harvest? : Do you produce surplus for sell?

	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23
CROP	AREA (Acres/ Hectare)	Amount of Seed (Kg)	Type of seed Hybrid=1 Landrace=2 OPV=3	Where did you obtain seed? Saved seed=1 NGO=2 Bought=3 Neighbours and family=4 Govt program=5	Is this variety of seed one that you prefer in terms of drought tolerance? Yes=1 No=2	Did you apply any fertilizer? Yes=1 No=2	Yield (Kg)	How much of the harvested crop was lost post-harvest period? <25%=1 25-50%=2 51-75%=3 >75%=4 Don't know=5 None=6	What was the major reason for this loss? Rodents=1 Storage pests=2 Moisture=3 Floods=4	What is the main storage method for this crop? Unprotected pile=1 Heaped in house=2 Bags in house=3 Chitandala in house=4 Chitandala outside house=5 Traditional nkhokwe=6 Improved nkhokwe=7 Metallic silo=8 Other=9	Did you sell any of the crops harvested last season? Yes=1 No=2	What proportion of the harvest did you sell? <25%=1 25-50%=2 51-75%=3 >75%=4 Don't know=5 None=6	Who bought? 1= Neighbours 2=Marketing Board/ADMARC 3=Private company (name) 4=Local market 5=Private individuals	At what price did you sell this crop? Price/unit
1=Maize														
2=Sorghum														
3=Millet														
4=Potatoes														
5=Ground beans														
6=Groundnuts														
7=Sweet Potatoes														
8=Beans														
9=Rice														
10=Tea														
11=Cotton														

12=Cassava														
13=Tobacco														

C24: What livestock do you own? How many have you sold, lost and why?

	C25	C26	C27	C28	C29	C30	C31	C32
What livestock do you own?	Man	Woman	Joint	Total	How many did you sell in last 12 months?	Main reason for selling Buy food=1 Meet daily expenses=2 Pay school fees=3 Healthcare costs=4 Herd maintenance=5 Repay a loan/rent/debt=6 Purchase insurance=7 Payment for social event=8 Other=9	Did you lose any of your animals in the last 12 months? Yes=1 No=2	If Yes, what was the main reason? Death due to water shortage=1 Death due to pasture shortage=2 Killed or injured by witchcraft=3 Theft=4 Accident/injury=5 Taken away at death of owner=6
Cattle								
Goats								
Sheep								
Pigs								
Donkeys								
Rabbits								
Chickens								

Are you currently using any of the following high productivity, soil and moisture conservation techniques? From where did you learn these techniques?

	Technique	Yes=1 No=2		Where did you receive training from? Local extension officer=1 Local NGO staff=2 Neighbour or friend in area=3 Farmer where household member provided *ganyu*=4 Knowledge passed on by parents=5 Out-grower scheme=6 Other=7
C33	Conservation tillage (basins, tied ridges, contour ridges)		C43	
C34	Treatment of stover with urea		C44	
C35	Improved food storage (granary, crib)		C45	
C36	Incorporation of legumes		C46	
C37	Fodder production and storage		C47	
C38	Water harvesting		C48	
C39	Agro-forestry		C49	
C40	Winter-ploughing		C50	
C41	Crop rotation		C51	
C42	Use of compost or manure		C52	

C53: What is your main source of agricultural labour? Household labour=1 Pool labour with neighbours=2 Hire labour to supplement own=3 Depend on machinery=4 Other (specify)=5		C54: At what stage within the farming season do you face the highest labour demand? Land preparation=1 Planting=2 Weeding=3 Spraying for pests=4 Harvesting=5 Thrashing/processing=6	

C55: In the last season, were you able to plant the main crop in time for the rainy reason? Yes=1 No=2**>>C57**		C56: If you did not plant your crops in time, what was the main reason for this? Lack of draught power=1 Lack of adequate farm labour=2 Was working for ganyu elsewhere=3 Delayed access to agricultural inputs=4 Illness or death within household=5 Not sure if season had actually started=6 Other reason=7	
C57: In the last season, did you have to replant any of the crops? Yes=1 No=2		C58: If Yes, what was the main reason for replanting? Poor seed quality=1 Dry spell or drought=2 Crop affected by flooding=3 Pests attacked crop=4 Damage by animals=5	
C59: Which crop did you have to replant? Maize=1 Cassava=2 Sorghum=3 Millet=4 Potato=5 Groundnut=6 Ground bean=7 Beans=8 Rice=9 Tea=10 Cotton=11 Tobacco=12		C60: Considering the risk of drought, what is your preferred seed type? Hybrid=1 Landrace/traditional saved seed=2 Open pollinated variety (OPV)=3	
C61: Did you apply any fertiliser in the last season? Yes=1 No=2		C62: If you did not apply any fertiliser in the last season, why was the main reason? Too expensive=1 Not readily available on local market=2 Feared risk of crop burning in a drought=3 Fertiliser weakens the soil=4 Other reason=5	
C63: How does your average yield in the last three years compare with the long term average for your main		C64: If the average yield has decreased, what is the main factor that has caused this?	

crops? No change=1 Has decreased=2 Has increased=3		 Soil quality has declined=1 Increased incidence of drought=2 Increased incidence of floods=3 Unavailability of inputs in time=4 Shortage of adequate labour=5 Other (specify)=6	
C65: If your yield has increased, what is the main reason for this? Use of higher quality seed=1 Use of fertiliser=2 Increased land under use=3 Increased labour access=4 Better extension advice=5 Access to irrigation=6		C66: For the crops that you store, how do you treat grain before storage? No treatment done=1 Add ash to the grain=2 Use of chemical application=3 Smoke treatment=4 Other method=5 ----------	
C67: How far do you live from the nearest market where you can buy food, products, and services? Less than 1 km=1 Less than 3 km=2 Less than 5 km=4 Less than 10km=5 Less than 20km=6 More than 20km=7		C68: How do you normally carry produce/food to or from this market? By head (walk) =1 On bicycle=2 On motorbike=3 Ox or donkey drawn cart=4 Use public transport=5	
C69: It is easy to get transport and from the market? Agree=1 Disagree=2		C70: Who is normally responsible for selling crops on the market within the households? *Record gender* Male=1 Female=2	
C71: Who is mainly responsible for making decisions on how the money from crop or livestock sales is spent? *Record gender* Male=1 Female=2		C72: Has the number of different crops that you grow changed in the last ten years? Yes=1 No=2	
C73: If YES, how has it changed? Increased=1 Decreased=2		C74: If the diversity of crops has decreased, why has that been? Unavailability of seed=1 Less rain to support other crops=2 Soil no longer suitable=3	

		No market for other crops=4 Less labour available=5 Other (specify)=6	
D. FOOD SECURITY			
D1: What is the staple food eaten in this household? Maize=1 Potatoes=2 Cassava=3 Sorghum=4 Millet=5 Rice=6		D2: What is the MAIN source of this food? Own production=1 Purchase from market=2 Received as payment for ganyu=3 Received as food assistance from NGO/GVT=4 Remittances/gift from household member /relative=5 Lease of land=6 Hunting and gathering from wild=7 Other=8	
D3: What proportion of the food that you eat comes from your own production? Less than 25% 25-50% 51-75% More than 75%		D4: For the 2009/2010 season, how long did the food that you produced last you? 0 months =1 Less than 3 months=2 Less than 6 months=3 Less than 9 months=4 Less than 12 months=5 Will last up to next harvest=6	
D5: What is the most important factor that limits the capacity of your household to ensure food security? Market prices too high or volatile=1 Loss of food in storage=2 Loss of food to theft=3 Absence of *ganyu*=4 Low farm productivity=5 Sending food to household member living elsewhere=6		D6: What proportion of your income do you spend on food? Less than 25%=1 25-50%=2 51-75%=3 More than 75%=4	
D7: Are you a member of a local grain bank? Yes=1 No=2		D8: Have you ever had to send some food to a household member living elsewhere despite knowing that remaining stocks would be inadequate? Yes=1 No=2	

D9:Have you ever had to sell part of your crop harvest despite knowing that stocks would be inadequate? Yes=1 No=2		D10: In the last 6 months, did your household give food to another household? Yes=1 No=2	
D11: Where was the food destined? Rural area=1 Urban area=2 International=3		D12: In the last 6 months, did you receive any food from another household? Yes=1 No=2	
D13: From where did you receive the food? Rural area=1 Urban area=2 International=3		D14: In coping with the last drought, did you make any new friends which you still maintain? Yes=1 No=2	

What coping strategies has your household had to use in the last 3 months to ensure access to food?

	Coping strategy	Yes=1 No=2
D15	Borrow food, or rely on help from friends and/or relatives	
D16	Rely on less preferred food or less expensive food	
D17	Purchase food on credit	
D18	Gather wild food or hunt	
D19	Harvest immature crops	
D20	Send HH members to eat elsewhere	
D21	Send HH members to beg	
D22	Limit portion sizes at mealtime	
D23	Restrict consumption by adults so children can eat	
D24	Restrict consumption of non-working members in favour of working	
D25	Reduce the number of meals eaten in a day	
D26	Skip entire days without eating	
D27	Rely on piecework	
D28	Steal from other villagers	
D29	Other (specify)	

Which of the following shocks did your household suffer in the last 12 months?

	SHOCK	Yes=1 No=2
D30	Floods	
D31	Drought	
D32	Earthquake/tremor	
D33	Crop pests or diseases	
D34	Crop failure	
D35	Livestock disease	
D36	Death of livestock	
D37	Theft of livestock	
D38	High food prices	
D39	Failure to market crop produce	
D40	Failure to market animal produce	
D41	End of regular assistance (food aid, remittances, etc)	
D42	Illness within household	
D43	Birth within the household	
D44	Death of income earner	
D45	Family involvement in land conflict	
D46	Reduction in non-agricultural income	
D47	Reduction in agricultural income	
D48	Break up of family	
D49	Theft of food	
D50	Accusation of witchcraft	
D51	Other (specify)	

D52: Total number of shocks experienced *Count **YES** responses above and insert number in box below:* ☐		D53: What was the WORST impact of this shock? Loss of asset/property=1 Food shortage=2 Loss of life=3	
D54: What was the worst shock you ever experienced which limited your household's ability to be food secure? *Please indicate ONLY one shock*. Floods=1 Drought=2 Earthquake/tremor=3 Crop pests or diseases=4 Livestock disease=5 Death of livestock=6 Theft of livestock=7 High food prices=8 Failure to market produce=9 End of regular assistance (food aid, remittances, etc)=10 Illness within household=11 Birth within the household=12 Death of income earner=13 Family involvement in land conflict=14 Reduction in non-agricultural income=15 Reduction in agricultural income=16 Break up of family=17 Theft of food=18 Accusation of witchcraft=19 Other (specify)=20			
D55: How long ago did you experience this shock? Within the last year=1 Less than 2 years ago=2 Less than 3 years ago=3 Less than 4 years ago=4 Less than 5 years ago=5 Within the last 10 years=6 Within the last 20 years=7 Over 20 years ago=8		D56: Have you managed to recover from the effects of this shock? Yes=1 No=2 Not sure=3	
D57: If you were to face a similar shock, would you be able to respond better and recover?		D58: What has changed now that would enable that recovery? Better experience in handling such crises=1	

Yes=1 No=2		Access to credit=2 Access to insurance=3 More capital assets=4 Better aware of sources of help=5 Using more resistant methods (seed, technology)=6 More emergency NGOs around=7 Presence of local disaster management plan=8	
E. EXPERIENCE OF DROUGHT			
E1: What was the worst drought you ever experienced? 1922=1 1949=2 1991/1992=3 1996/1997=4 2005/2006=6 2007=7 2009/2010=8 Other=9		In your view, what factor made this drought intense? *Tick all applicable* E2 Followed another drought E3 Followed a flood E4 No food available on market E5 Outbreak of disease E6 High food prices E7 Restrictions on prices and quantities E8 Communication was late E9 Lack of information on food sources E10 No information on progress of drought E11 Other (specify)	Yes=1 No=2
E12: What was the worst impact of this drought on your household? Loss of land =1 Loss of livestock=2 Loss of farming implements=3 Family breakdown=4 Children married off for food=5 Children dropped out of school=6 Death within the household=7 Loss of employment/income=8			

If you lost livestock, how much livestock did you lose and how much have you managed to recover?

	Asset	Number before drought	Number after drought	Recovery of all livestock Yes=1; No=2
E14	Cattle			
E15	Goats			
E16	Pigs			
E17	Donkey			
E18	Sheep			
E19	Poultry			

E20: What was the worst impact of this drought on your household? Loss of land =1 Loss of livestock=2 Loss of farming implements=3 Family breakdown=4 Children married off for food=5 Children dropped out of school=6 Death within the household=7 Loss of employment/income=8		E21: Was it your intention to recover the livestock that you had lost to the drought? Yes=1 No=2	
E22: If you managed to restock any of your livestock, how long did it take to achieve this? Less than 3 months=1 Less than 6 months=2 Less than a year=3 Less than two years=4 Less than five years=5 Less than ten years=6 More than 10 years=7		E23: Within this time, were you exposed to another shock? Yes=1 No=2	
E24: What was the magnitude of this shock compared to the first one? Smaller=1 Similar=2 Larger=3		E25: Which livestock class was of priority for you to recover? Cattle=1 Goats=2 Pigs=3 Donkey=4 Sheep=5 Chicken=6 Rabbits=7	

E26: Why was this livestock a priority for recovery? Status=1 Multiple benefits to household=2 Resilient to drought=3 Easy to sell during a crisis=4 Faster reproduction cycle=5 Other=6		E27: What do you consider as most important to enable recovery following a drought? Access to capital (cash)=1 Access to liquid assets=2 NGO or government assistance=3 Access to insurance=4 Access to credit=5 Help from friends and relatives=4 Availability to *ganyu*=5 Ownership of livestock=6 Subsidised seed and fertiliser=7 Having reserves in grain bank=8 Prayers, hope and endurance=9	
E28: If you were faced with a drought of similar magnitude as the worst drought you ever experienced, do you think you would be able to survive? Yes, definitely=1 Maybe=2 No=3 Not at all=4		E29: When people sell assets in response to drought, what is the MOST important factor that determines what they sell? Ease of replacement=1 Market availability=2 Ability to meet larger consumption needs from single sale=3 Vulnerability of asset to drought=4 Non-utility of asset in agriculture=5 Other reason=6	
E30: Following this experience of drought, are there any new practices that you adopted to reduce your future vulnerability to drought? Yes=1 No=2			

If Yes, what changes or adjustments to crop production did you make following drought experience?

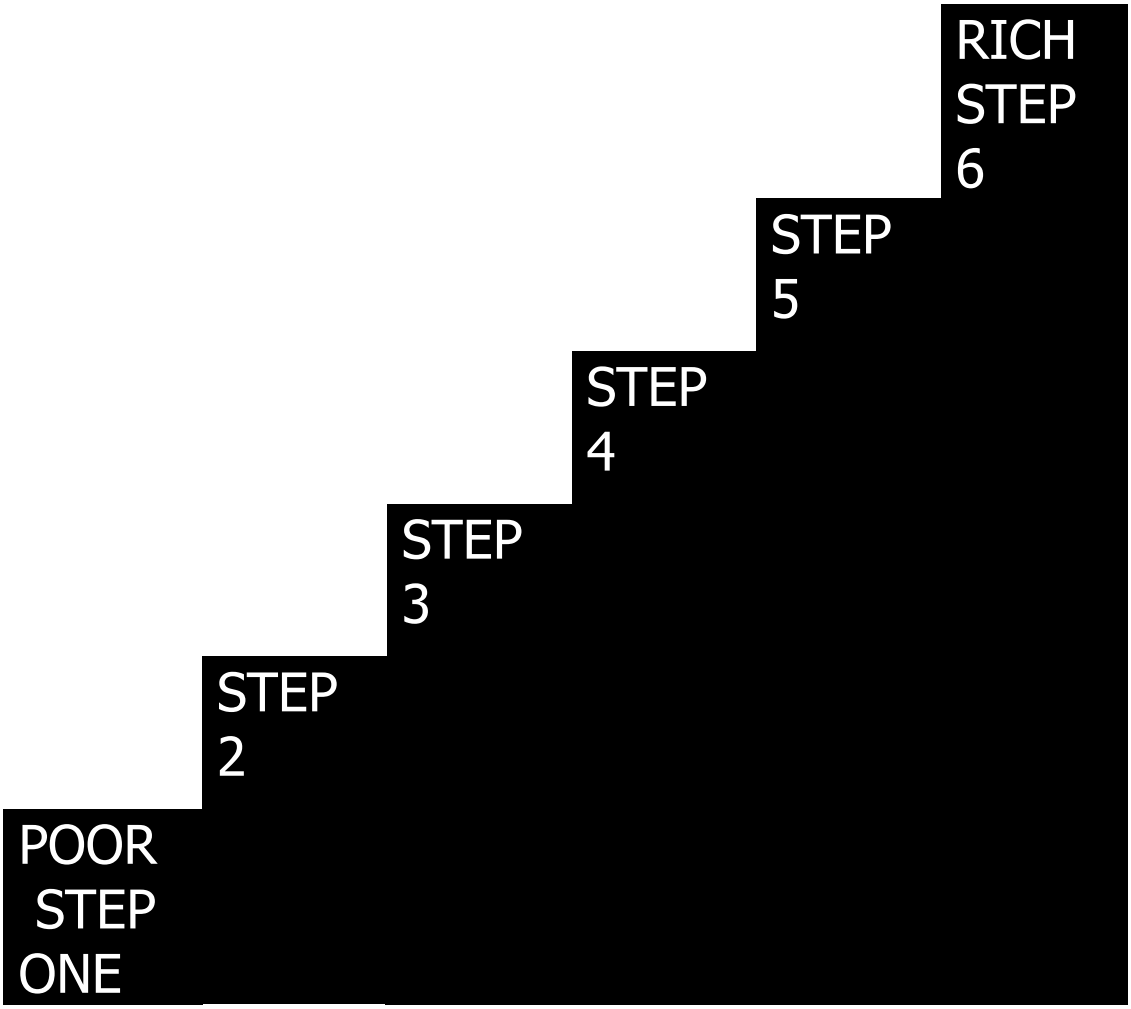
		Yes=1 No=2
E31	Drought tolerant crops	
E32	Drought tolerant varieties	
E33	Introduced water management technique	
E34	Stopped using fertiliser	
E35	Relied more on seasonal forecasts	
E36	Increased crop diversity	
E37	Other (specify)	

E38: Following this experience of drought, are there any new practices that you adopted to reduce your future vulnerability to drought? Yes=1 No=2		E39: In your view, which was the best farming season ever? *Give year of harvest*. ☐☐☐☐	
E40: What is the MAIN feature that made this a good season? Rainfall distribution was good=1 Procured inputs in time=2 Had access to labour=3 Prices of products were good=4 No pest problem=5		E41: Based on own-food production and other sources, how long were you able to provide adequate food for your household? Less than three months=1 Less than six months=2 Less than nine months=3 Less than a year=4 Food lasted up to next harvest=5	
F. SEASONAL FORECASTS AND DISASTER RISK REDUCTION			
F1: Have you ever made farming decisions based on seasonal weather forecast? Yes=1 No=2		F2: Did you use the seasonal forecast information in the last season? Yes=1 No=2**>>F7**	
F3: If YES, from where did you receive it? Radio broadcast=1 Local agricultural extension officer=2 Local leader=3 Other community members=4 Local NGO officer=5 Meteorology department officer=6 Local disaster management committee=7 Traditional healer=8 Newspapers=9		F4: Did you share this information with anyone else within your community? Yes=1 No=2	

F5: Was the information that you received useful for making decisions? Yes=1 No=2		F6: What is the main decision that you made based on this information? Changed choice of crop=1 Changed variety of crop=2 Purchased more food for storage=3 Altered size of the field used=4 Did not farm at all=5 Moved to higher ground=6 Sold livestock earlier=7 Stored food for later=8 Reduced consumption earlier=9 Insured crop and livestock =10	
F7: Would you consider using seasonal climate forecasts in the future? Yes=1 No=2 Maybe =3		F8: Have you heard the seasonal forecast for the 2010/2011 season? Yes=1 No=2	
F9: Is there a disaster management plan in your area? Yes=1 No=2**>>F13** Not sure=3**>>F13**		F10: If YES, were you consulted at any point in the development of this plan? Yes=1 No=2	
F11: In your view, do you think the disaster management plan focuses on the most important shocks in your community? Yes=1 No=2 Not sure=3		F12: If not, what should be the main focus? Drought=1 Flood=2 Pests and diseases=3 Market price fluctuations=4 Earthquakes=5 Other=6	
F13: In the event of a flood are you aware of the evacuation plan? Yes=1 No=2		F14: If you were asked to contribute money towards a community drought risk management project, would you be willing? Yes=1 No=2	
F15: How about a community flood management project? Yes=1 No=2		F16: If No, who should provide the funding for disaster risk reduction? Government =1 NGOs and donors=2 Business people=3 Richer community members=4 Other=5	

F17: In your view, do you think this community is resilient to disasters? Yes=1 No=2		F18: If Yes, what do you think enables this resilience? Work together=1 Strong resilient spirit=2 Good leadership=3 Presence of NGOs and government=4 Historical experiences=5	
F19: If not, why is that? People do not help each other=1 Too dependent on NGOs=2 Limited resources to recover=3 Weak leadership=4 Lack of skills to deal with disasters=5 People have given up=6		F20: Is there anyone in your village whom you know who has been trained on assessing disasters and other ways of disaster risk reduction? Yes=1 No=2	
F21: In your view, has the climate in your area changed? Yes=1 No=2 Not sure=3		F22: What is the MOST significant change that you have observed? Increased droughts/dry spells=1 Reduced droughts/dry spells=2 Increased flooding=3 Reduced flooding=4 Delay in start of season=5 Frequent false start to season=6 Unusually warmer=7 Unusually cooler/colder=8	
F23: Imagine a 6 step ladder where on the top are the rich and the bottom, the poor in your community..... How would you rate your wealth position in terms of the steps below? Step 1=1 Step 2=2 Step 3=3 Step 4=4 Step 5=5 Step 6=6		F24: How would you rate the wealth status of most of the people from whom you normally seek or provide assistance in times of need? Step 1=1 Step 2=2 Step 3=3 Step 4=4 Step 5=5 Step 6=6	

Thank you very much for your time. Your contribution will be very important in developing ways to improve capacities of communities to be more resilient to drought in the future


RICH
STEP
6
STEP
5
STEP
4
STEP
3
STEP
2
POOR
STEP
ONE

Annex 3: Focus Group Discussion Guide

Focus Group Discussion Guide

Introduction

1. Have you always lived here? If not, where did you or your forefathers come from? Why did you/they choose this place?
2. What are the things that make this area 'tick'?

Livelihoods

3. What are the main livelihood activities that people in this area depend on? Have you always depended on these livelihood activities? If not, what necessitated changes in the main livelihoods?
4. Have things always been like this? What changes in livelihoods have you noticed in the past decade (s)?

Agricultural Production

5. What are the main crops cultivated, and which livestock do people keep?
6. What are the average production levels for these crops? Has this changed when compared with the long term experience? What has led to these changes?
7. On average, how much land do people in the different socio-economic groups own? How land is normally accessed in this village?
8. Of the crops and animals produced, are there any particular preferences? (Prompt for taste, yield, and drought suitability).

9. Are there any differences in access to such resources as land, labour, seed and fertiliser? What causes such differences?
10. Within the household, how are farming decisions normally made? Who makes the decisions on what to plant, where, when to harvest and how much to sell? What information do you normally receive or require at the start of each farming season?
11. On average, how long does food harvested normally last? What factors currently constrain agricultural production in this area? (Prompt for diseases and pests, inputs and markets, labour, extension advice).

Food Security Status

12. What food do people normally consume here? How diverse is the diet, and how does this diversity change over the year? Has the diet changed over the years?
13. What do you consider a food secure household? What proportion of the village can afford to be food secure all year through? What are the characteristic features of food secure households?
14. For what proportion of a year are people in the different socio-economic groups in this village food secure? Around which month do the majority of people in this village face food insecurity?
15. How do people cope with food insecurity in this village? Have they always relied on these coping strategies? If not, what changed?

16. What prevents people from achieving household food security? How important are droughts and floods as causes of food insecurity?

Experience of Drought

17. What are the main climatic stressors that you experience in this area? How frequent do you experience these stressors?
18. On which years or farming seasons did you experience droughts in this area? How about floods? What was the effect of these shocks?
19. Has the climate in this area always been like this? If not, what changes have you observed? What do you think is causing these changes and what adjustments have you made to cope with or benefit from these changes? Are there any specific efforts to address this?
20. In typical drought years which households suffer the most? Why is that?
21. What 'things' enable people to deal successfully with droughts? What are the priority assets that would enable one to survive a drought or flood?
22. When was the worst drought and floods ever experienced? What happened? How long did it take you to recover from this drought? What helped your recovery, and if you were faced with a similar drought, would you be able to better deal with it? If yes, what changes have taken place that allow for better capacity to deal with drought?
23. Is there a system for assisting seasonal planning? Do people rely on seasonal forecasts? If not, why? How reliable and useful are these for

reducing impact of droughts? What changes do people normally make given forecast information?

Vulnerability

24. What makes food insecurity occurrence common in this district?
25. Which households are most likely to suffer in a poor rainfall season? How about on a year that floods are experienced?
26. What are some of the impacts of droughts and floods? In responding to droughts, what assets are normally lost? Which assets are strategic to have in a typical drought year, and why?
27. Other than droughts and floods, what factors contribute to increased risk of food insecurity besides droughts? In responding to droughts, what assets are normally lost?
28. What are some of the historical, political, economic and institutional factors that have contributed to vulnerability to food insecurity in this area?
29. What should be done differently to reduce the impact of droughts?

Coping Strategies and Adaptive Capacity

30. Over time what lessons have been learned in terms of coping with drought?
31. What has enabled this community to survive droughts in the past?

32. If there was a drought as serious as the worst drought that you have faced, do you think you will be able to survive it? Why is that?
33. What types of household are better able to deal with droughts?
34. How do different people (poor, middle and better off/rich) cope with food insecurity what are the positive and negative coping strategies being used?
35. How are local problems responded to by authorities? What are some of the communication channels available?
36. Is there a disaster management committee and plan in this village? How is the committee selected? Why and how did the idea of such a committee come about? What disasters does the committee focus on?
37. Is there any evidence that people have learned from previous disasters? What has been learned, and what is being done differently? If not, what is constraining the uptake of lessons learned?
38. What happens to disaster management projects when NGOs pull out? Can you as communities cope on your own?
39. What changes would better enable this community to deal with different shocks?
40. Who should fund such changes? Is the community willing to invest time and resources in making such changes?

Annex 4: Key Informant Interview Guide

Key Informant Interview Guide

Introduction

1. How long have you been living /working in this district? If you have not always lived here, what motivated you to come and live here?
2. What are the things that make this local area "tick"?
3. What are some of the main development issues in this area? Are there any specific shocks or stressors that are of particular concern for people living here?

Livelihoods

4. What are the livelihood activities that people in this local area depend on? What determines the capacity of a household to engage in the various livelihood activities available?
5. Are there any significant changes in the livelihoods of local people that you have observed? What changes have you noticed, and what factors have led to such changes?
6. What factors allow for the various livelihoods to be possible? (Prompt for environmental, social, economic, institutional). How effective are these different livelihoods in ensuring incomes and food security at household and community levels?
7. What are the factors that constrain local livelihoods from attaining their goals (income and food security, general well-being)? Which households

are most affected by these constraints, and why? What changes could enhance the effectiveness of livelihoods?

8. What interventions is your organisation currently implementing to address some of the local challenges? How is your organisation selecting beneficiaries (i.e. district, community, household levels).
9. What projects have been implemented in the past? If there are any different, what prompted the change in focus? How successful have these been in addressing the local challenges? If not very successful, why has that been?

Vulnerability

10. What is the general food security situation like in this area? What are the main factors contributing to food insecurity?
11. What are the characteristics of households that are more frequently affected? Why are these households more susceptible?
12. When droughts or floods are experienced in this area, which households are mainly affected? How are different social groups affected by droughts and floods?
13. How frequent are droughts and floods experienced in this area? Has this changed over time? What changes have you observed? What could have caused these changes? Are there any local factors that increase vulnerability to drought-induced food insecurity?

14. What are some of the factors that render people vulnerable to food insecurity due to droughts and other stressors? Are there any historical and contemporary factors that have contributed to this vulnerability to food insecurity?

Coping Strategies and Adaptive Capacity

15. What coping strategies do people resort to when faced with food insecurity? How effective are these coping strategies for ensuring food security? Have they always depended on the same strategies? If not, what changed?
16. Of the coping strategies used in this area, which ones seem to be working, and which ones are not? Are there any unintended outcomes that result from dependence on these coping strategies?
17. Are there any planned and or autonomous measures that are being implemented locally to reduce the risk and impact of droughts and other stressors on agriculture and food security? What measures are these? How effective have these measures been?
18. How has the uptake of measures to improve agriculture and reduce risks such as drought been? Are there any characteristic differences between households that have and those that have not taken up such measures? What factors have discouraged uptake of promoted measures?

19. What policies and programmes are currently being used to address vulnerability? What policies and programmes have been implemented in the past, and with what results?
20. How are locals adapting to drought and floods? What are they doing differently as a result of past experiences? What or who has driven these adjustments?
21. How easy is it to change things (e.g. farming practices) in this area? Why? What are local peoples' attitudes towards new technologies (e.g. in agriculture)?
22. Would you consider this community resilient in the face of droughts? What does resilience mean to you? Without external support, would this community survive droughts, floods and other stressors?
23. Is there any Disaster Risk Reduction and Recovery plan in place? What disasters does it focus on? How was it formed? Who has received training in management of disasters?
24. Are there any elements within the local culture that promote/ hinder the ability to respond to droughts, floods and other stressors?
25. What should be done to promote food security and more sustainable livelihoods?